DOCUMENT RESUME

ED 133 603 CE 009 724

AUTHOR Rutledge, Gene; And Others
TITLE Proceedings of the Annual National Clinic on Technical Education (12th, Spokane, Washington, March 26-28, 1975). Human Resource Development: Technical Education's Challenge.
INSTITUTION American Technical Education Association, Inc., Delmar, N.Y.; American Vocational Association, Washington. D.C. Technical Div.; Office of Education (DHEW), Washington, D.C.
REPORT NO VT-103-540
PUB DATE Mar 75
NOTE 62p.

EDRS PRICE MF-$0.83 HC-$3.50 Plus Postage.
DESCRIPTORS Career Education; Conference Reports; Conferences; *Educational Development; *Educational Planning; *Human Development; *Human Resources; Industrial Education; Medical Services; Secondary Education; Staff Improvement; *Technical Education

ABSTRACT

This report includes the presentations of the speakers appearing before the National Clinic on Technical Education. Topics cover human resource development; the impact of technical education on economic development (in Mississippi); economics of allied health education; manpower implications of environmental protection; manpower needs for environmental protection--water; manpower needs for nuclear energy; educational facilities planning; metrics conversion and technical education; Comprehensive Employment and Training Act and its implications for technical education; training minorities in technical education; industry based career education; developing manpower for nuclear technology; faculty development in technical education; growth areas in medical services; identifying human resources (a discussion of the Department of Defense High School Testing Program); technical education in Washington; marketing technical education; and the state of the art of technical education. Members of the American Technical Education Association (ATEA) National Planning Committee, exhibitors, officers, representatives, speakers, and others are also listed in the report. (TM)

****
* Documents acquired by ERIC include many informal unpublished *
* materials not available from other sources. ERIC makes every effort *
* to obtain the best copy available. Nevertheless, items of marginal *
* reproducibility are often encountered and this affects the quality *
* of the microfiche and hardcopy reproductions ERIC makes available *
* via the ERIC Document Reproduction Service (EDRS). EDRS is not *
* responsible for the quality of the original document. Reproductions *
* supplied by EDRS are the best that can be made from the original. *
****

ED133603

RECEIVED
SEP 22 1976
Info. Acq., CVTE

PROCEEDINGS
OF THE
TWELFTH ANNUAL
NATIONAL CLINIC ON TECHNICAL EDUCATION

Human Resource Development: Technical Education's Challenge

Sponsored by

American Technical Education Association

and

U. S. Office of Education

and

American Vocational Association-Technical Division

hosted by

Washington State Community College District 17

and

Washington State Coordinating Council for Occupational Education

VT 103 540

DAVENPORT HOTEL

SPOKANE, WASHINGTON

March 26-28, 1975

U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
NATIONAL INSTITUTE OF EDUCATION

THIS DOCUMENT HAS BEEN REPRODUCED EXACTLY AS RECEIVED FROM THE PERSON OR ORGANIZATION ORIGINATING IT. POINTS OF VIEW OR OPINIONS STATED DO NOT NECESSARILY REPRESENT OFFICIAL NATIONAL INSTITUTE OF EDUCATION POSITION OR POLICY

CE 009 724

ATEA NATIONAL PLANNING COMMITTEE

WALTER BROOKING, HONORARY CHAIRMAN
U.S. Office of Education
Washington, D.C.

GEORGE MEHALLIS, CHAIRMAN
Miami-Dade Community College
Miami, Florida

MARY ELLIS, ATEA PRESIDENT
Technical Education Research Center
Washington, D.C.

ODIN STUTRUD, ATEA EXECUTIVE DIRECTOR
North Dakota State School of Science
Wahpeton, North Dakota

RICHARD B. HALVORSON, CHAIRMAN
Local Planning Committee
Washington State Community College District 17
Spokane, Washington

ALVIN B. DANIELSON, CO-CHAIRMAN
Washington State Community College District 17
Spokane, Washington

F. LEIGH HALES, CO-CHAIRMAN
Washington State Community College District 17
Spokane, Washington

HARRY BIGELOW
Argonne National Laboratory
Argonne, Illinois

ARTHUR BINNIE
Coordinating Council for Occupational Education
Olympia, Washington

JIM BLUE
Coordinating Council for Occupational Education
Olympia, Washington

COL. RICHARD CULBERTSON
Community College of the Air Force
Randolph AFB, Texas

LEON HARDISON
State Technical Institute at Memphis
Memphis, Tennessee

SAM KERR
Department of Health, Education and Welfare, Region X
Seattle, Washington

SARAH PATTERSON
Washington State Community College District 17
Spokane, Washington

ROLAND L. ROY
Central Washington State College
Ellensburg, Washington

JAKE SALLEY
Columbia Technical Education Center
West Columbia, South Carolina

GEORGE M. SHAW
Utah State University
Logan, Utah

JACK TOMPKINS
Texas State Technical Institute
Waco, Texas

CHARLES O. WHITEHEAD
State Technical Institute at Memphis
Memphis, Tennessee

LOCAL PLANNING COMMITTEE

RICHARD B. HALVORSON, CHAIRMAN
Director, Governmental Affairs
Washington State Community College District 17
Spokane, Washington

ALVIN B. DANIELSON, CO-CHAIRMAN
Administrative Assistant for Instruction
Washington State Community College District 17
Spokane, Washington

F. LEIGH HALES, CO-CHAIRMAN
Special Programs Supervisor
Washington State Community College District 17
Spokane, Washington

CLINIC OPERATIONS

SARAH PATTERSON
Office of Governmental Affairs
Washington State Community College District 17
Spokane, Washington

DONNA CLARK
Office of Special Programs
Washington State Community College District 17
Spokane, Washington

MEDIA RELATIONS

JANE A. JOHNSON, COORDINATOR
Office of Public Information
Washington State Community College District 17
Spokane, Washington

COMMUNICATIONS

JOHN M. THOMPSON, DIRECTOR
Learning Resources
Spokane Falls Community College
Spokane, Washington

JERRY P. CUMMING
Audio-Visual Department
Spokane Community College
Spokane, Washington

GUEST PROGRAM

BETTY J. HAMMOND, COORDINATOR
Women's Activities and Programs
Spokane Falls Community College
Spokane, Washington

SHIRLEY A. MICHAELSEN, COORDINATOR
Women's Programs
Spokane Community College
Spokane, Washington

PROMOTION

SANDRA J. HANSON, SPECIAL PROJECTS DIRECTOR
Office of Governmental Affairs
Washington State Community College District 17
Spokane, Washington

GRAPHIC DESIGN

BEVERLY A. CALICOAT, GRAPHIC ILLUSTRATOR
Office of Public Information
Washington State Community College District 17
Spokane, Washington

CINDY SEIPP
Office of Special Programs
Washington State Community College District 17
Spokane, Washington

DISPLAY DESIGN

CHARLES R. ROADRUCK
Art Department
Spokane Falls Community College
Spokane, Washington

EXHIBITORS

A. B. DICK COMPANY
Spokane, Washington

ALLCRAFT TOOL AND SUPPLY CO., INC.
Fullerton, California

AMERICAN SERVICE COMPANY
Marysville, Washington

AMERICAN TECHNICAL SOCIETY
Chicago, Illinois

BRUNING DIVISION OF AM CORPORATION
Seattle, Washington

CONTEMPORARY INSTRUCTION
Hillsboro, Oregon

CUMMINGS PUBLISHING COMPANY, INC.
Menlo Park, California

DELMAR PUBLISHERS
Albany, New York

THE ELECTRIFICATION COUNCIL
New York, New York

JON B. JOLLY, INC.
Seattle, Washington

LIQUID AIR, INC.
Spokane, Washington

McGRAW-HILL BOOK COMPANY
New York, New York

PRENTICE-HALL, INC.
Englewood Cliffs, New Jersy

SCHOOL FUTURES
Lake Oswego, Oregon

SCOTT-ENGINEERING SCIENCES
Pompano Beach, Florida

SUN ELECTRIC
Chicago, Illinois

TEKTRONICS
Seattle, Washington

XEROX CORPORATION
Spokane, Washington

OFFICERS

ODIN C. STUTRUD
Executive Director
North Dakota State School of Science
Wahpeton, North Dakota

WILLIAM N. FENNINGER
Executive Director Emeritus
Delmar, New York

MARY ELLIS
President
Washington, D.C.

LEON B. HARDISON
Vice-President
Memphis, Tennessee

HARRY BIGELOW
President Elect
Argonne, Illinois

J. L. TOMPKINS
Past President
Waco, Texas

1974-75 TRUSTEES

Jack L. Tompkins
Vice President
Texas State Technical Institute
Waco, Texas

Mary Ellis, Director
Washington Office
Technical Education Research Center
Washington, D.C.

Harry Bigelow
Executive Assistant
Argonne National Laboratory
Argonne, Illinois

Fred Brinkman
President
Los Angeles Trad-Tech College
Los Angeles, California

Clyde Hall, Chairman
Division of Technical Studies
Savannah State College
Savannah, Georgia

Anna M. Gorman
Center for Vocational & Technical Education
Ohio State University
Columbus, Ohio

Wilson M. Sorenson
President
Utah Technical College
Provo, Utah

Leon Hardison
Div. Head, Related Studies
State Technical Institute
Memphis, Tennessee

George Mehallis, Director
Technical-Vocational Studies
Miami-Dade Community College
Miami, Flordia

Ruth E. Midjaas
Consultant
Oakland Schools
Pontiac, Michigan

George Parkinson
Director Emeritus
Milwaukee Area Technical College
Milwaukee, Wisconsin

Donald Phillips, Assoc. Professor
Technical Teacher Education
Oklahoma State University
Stillwater, Oklahoma

Hubert D. Reid, Dean
Occupational Education
Macomb Community College
Warren, Michigan

Roland Roy, Teacher-Educator
Vocational-Technical
Central Washington State College
Ellensburg, Washington

Anita Smith
Health Occupations Div. Chairman
Western Wisconsin Technical Institute
LaCrosse, Wisconsin

Jimmie Styles, Vice Chancellor
Research and Development
Tarrant County Junior College District
Fort Worth, Texas

Fred Thornton, Jr.
Supervisor, Mechanical Training
Tennessee Eastman Company
Kingsport, Tennessee

Richard N. Culbertson
Chief, Liaison Division
Community College of the Air Force
Randolph AFB, Texas

Barbara Walter
Chairman, Home Ec. Division
Western Wisconsin Technical Institute
LaCrosse, Wisconsin

Arnold Metz, Dean
Vocational Technical Education
St. Clair County Community College
Fort Huron, Michigan

Roger Mussell
Associate Professor
William Rainey Harper College
Palatine, Illinois

Arnold Potthast, Chief
Trade and Industry
Wisconsin Board of Voc. Tech.
Adult Ed.
Madison, Wisconsin

REGIONAL REPRESENTATIVES

Atlantic Region

James S. Smith, Specialist
Vocational-Technical Division
Maryland State Department of
Education
Baltimore, Maryland

Central Region

Arnold E. Metz, Dean
Vocational-Technical Education
St. Clair County Community
College
Port Huron, Michigan

New England Region

Joseph Salvatore, Chairman
Department of Engineering Tech-
nology
Rhode Island Junior College
Warwick, Rhode Island

Northwestern Region

Dr. Roland L. Roy, Instructor
Vocational-Technical Education
Central Washington State College
Ellensburg, Washington

Pacific Region

David O. Taxis, Administrator
Career Education
Los Angeles County Supt. of
Schools Office
Downey, California

Plains Region

Bill E. Walker, Dept. Head
Drafting and Design
Western Iowa Tech
Sioux City, Iowa

Southeastern Region

Dr. Ed Kurth
Auburn University
Auburn, Alabama

Southwestern Region

E. R. Billings
General Manager of Instruction
Texas State Technical Institute
Waco, Texas

Canadian Region

J. W. Oswald, Technical Director
Westland Secondary School
Niagara South Board of Education
Niagara Falls, Ontario Canada

Bertram F. Addy
St. Stephen, N.B. EOG 3AO
Canada

DIRECTORY OF SPEAKERS

John L. Baird, Coordinator
Energy Policy
U.S. Office of Education
Washington, D.C.
(Speech not available for publication)

Arthur A. Binnie, Director
Coordinating Council for Occupational Education
Olympia, Washington

James L. Blue, Director
Vocational Curriculum
Vocational Curriculum Management Center
Olympia, Washington
(Speech not available for publication)

Bob Briley, Public Affairs Director
KHQ Television
Spokane, Washington

Dr. Robert Brown, Chairman
Nuclear Technology Programs
Texas State Technical Institute
Waco, Texas

Rowland Bond (Retired)
Educational Reporter
Spokane Daily Chronicle
Spokane, Washington

Cal Dupree, Program Assistant
Native American Education and Community Affairs
State Board for Community College Education
Olympia, Washington

Ben F. Epps
Coordinator of Industrial Training
State Department of Education
Jackson, Mississippi

Ed Foss, Chairman
Marine Division
Cape Fear Technical Institute
Wilmington, North Carolina

Beverly Funk, Instructor
Business and Office Education
Spokane Community College
Spokane, Washington
(Speech not available for publication)

John Glenn
State Technical Institute at Memphis
Memphis, Tennessee

Dr. Kenneth Gudgel, M.D., Director
Family Medicine Spokane
Spokane, Washington

William F. Hagan
National Program Development Officer
Office of Education and Manpower Planning
U.S. Environmental Protection Agency
Washington, D.C.

Vern Hammer, Department Chairman
Sanitary Engineering
University of Washington
Seattle, Washington

Wendell Harrell, Associate Dean
Occupational Education
Seattle Central Community College
Seattle, Washington

Dr. Alberta Hill, Professor
Department of Education
Washington State University
Pullman, Washington

Barry Hill, Chairman
Business Department
Spokane Community College
Spokane, Washington

Dr. James L. Hoerner, Assistant Professor
Virginia Polytechnic Institute and State University
Blacksburg, Virginia

Dan Hull, Project Officer
Technical Education Research Centers
Texas State Technical Institute
Waco, Texas

Bernard Krockover
Armed Forces Vocational Testing Group
Randolph Air Force Base
Universal City, Texas

Ralph C. Kuhli, Director
Department of Allied Medical Professions and Services
American Medical Association
Chicago, Illinois

Viola Levitt, Director
Health Occupations
Prince George's Community College
Largo, Maryland

Dean McCorkle, CETA Representative
U.S. Department of Labor
Region X
Seattle, Washington

John W. McGough
Walker, McGough, Foltz and Lyerla
Spokane, Washington

Roger Mussell, Coordinator
Electronics Technology
William Rainey Harper College
Palatine, Illinois

Ouida Norris, Chairman
Department of Biomedical Engineering Technology
Monroe Community College
Rochester, New York

James Piercy
Associate Dean of Instruction
Lane Community College
Eugene, Oregon

Gordon J. Rogers
Engineering Administrative Manager
Westinghouse Hanford
Richland, Washington

Roland Roy
Central Washington State College
Ellensburg, Washington

Dr. Gene Rutledge, Executive Director
Office of Nuclear Energy Development
Idaho Falls, Idaho

B. W. Saterlee, Manager
Nuclear Energy Relations Department
General Electric Company
San Jose, California

Walter Schaar, General Manager
KSPS Television
Spokane, Washington

Edward S. Singler
Manpower Coordinator Officer
Department of Health, Education and Welfare
Region X
Seattle, Washington

Bruce Walker
Walker, McGough, Foltz and Lyerla
Spokane, Washington

Dr. Virginia White
Juanita High School
Kirkland, Washington

Frank Winar
Coordinating Council for Occupational Education
Olympia, Washington

Neil Uhlman, Director
Technical Education Clearinghouse
Council on Higher Education
Olympia, Washington

Dr. Gene Rutledge

Human Resource Development

Ladies and Gentlemen:

I am very pleased to have been invited to address the annual meeting of the American Technical Education National Clinic. My background is in energy research, development and production, especially the nuclear discipline, and in recent years the geothermal, solar and hydrogen fields. Therefore, I am especially pleased to be with you since I shall not be doing what is a common sin among many speakers; namely, talking to themselves.

There has never been a time when it has been more important for the energy community, certainly the nuclear community, to establish a communication with all people, not just those of their own household.

First off, I would like to go back a couple of hundred years ago. At that time the Indians probably sat in council in this vicinity. Even Lewis and Clark had not completed their famous journey south of here until a few years later in 1804-06.

It might be interesting to note that it is quite possible that a white man was in this area a couple of hundred years ago, because if you read your history books you will find that Lewis uncovered the fact that a white man did live with a tribe of Indians east of here in 1806. Lewis didn't get to meet this white man because he and the Indians managed to get into a little fracus and Lewis felt that it was wise to put as many miles between his party and the Indians as possible as quickly as possible. Lewis and his party hightailed it out of there covering 100 miles in one day on horseback. The next day-campwide-there were acute cases of saddle sores.

Now let us move to a time period only 100 years ago. You will find that in Spokane, January of 1875, H.T. Cowley opened the first school in this area in his home and had six pupils. This was the start of the formal development of human resources in this town.

Today we find that the development of human resources is more important than ever. In the energy field, especially the nuclear field, this development is extremely important because of the complex nature of today's problems.

The cost of retro-fitting a nuclear plant after it goes critical is highly expensive, calling for a greater degree of engineering excellence than ever before. We must do the job right, the first time. Only with the proper training of our human resources can we hope to meet this necessary goal.

Now then, I would like to point out that our speakers tomorrow are going to go into detail with respect to manpower needs in the energy field. These talks tomorrow we shall find extremely interesting. From your program you will note that John L. Baird will speak on "Manpower Needs for the National Energy Problem." "The Manpower Needs for Nuclear Energy" will be given by B.W. Saterlee and Stephen Byrnes will speak on "Manpower Needs for Fossil Energy." I think that these speakers will not only be very interesting but their material is very timely because of the energy situation in the nation. This timing is of extreme importance to every person in this room.

The President has stated recently that he has a goal of an additional 200 nuclear power plants by 1985 and an additional 150 coal plants by 1985.

Now, if one knows the manpower requirements for one 1000 megawatt nuclear power plant, it is rather easy to multiply this number by about 200 to roughly estimate the manpower required for all of these plants. You will find the construction and operating of a power plant requires a certain number of people, but for a truer manpower need you must consider the entire nuclear cycle--mining to enrichment to waste management, and in the coal cycle--mining to transportation to pollution control.

So here again, I urge you to pay careful attention to the program tomorrow because there is going to be an enormous need for technical training in our future energy program . . . . .MAYBE.

Now then, I would like to spend a little bit of time on a concern that is facing us in this nation--a possible nuclear morator-

ium, and this is the reason I add the . . . . . MAYBE.

Generally speaking, those who are the most vociferous in their stand against uranium and coal for electrical production and advocate, within the next decade, simple solutions - wind - solar - geothermal - are those who have contributed the least in research, development and production of energy.

I am promoting the "simple" solutions with vigor, but there is no way these simple solutions can capture 1% of the nation's Electrical Energy Production by 1985, probably not even by 1995.

As it stands today, there are only three options for future electrical energy production in the next 20 years: (1) burn coal (2) burn uranium and (3) do without a hell-of-a-heap. Now if a moratorium prevents us from getting the 200 nuclear power plants desired by the President by 1985 that means that about 200,000 megawatts of our energy requirements must be taken up by option (1) or (3). Since there are many problems associated with the coal energy effort--mining, transportation, etc., we may be hard pressed to meet the President's goal of 150 coal-fired power plants let alone expect coal to take up the slack and furnish an additional 200,000 megawatts of power.

At any rate, what really will happen is that more emphasis will be placed upon option Number 3--namely, "do without a hell-of-a-heap." Unfortunately, I do not have quantative answers to give you exactly what that means. I do know that during the coal strike in England that several things occured that may relate to our situation.

*British industry had to go to a three day work weak.
*Domestic consumers were asked to heat only one room (in cold February).
*Imported candle sales soared.

Certainly the federal government or someone credible must point out to us at an early date exactly who is going to do without energy and how much we will do without if the President's goals are not met.

The rush of events has thrust the energy crisis to the center stage--the nation's attention is focused there--adding a sense of urgency. Solving these problems may be the single greatest challenge of our time--and the inventiveness of man.

Development of human resources in all technical fields must focus on two important aspects in our changing society--education must not only teach its people to perform the work and provide the services required to maintain and further develop the society, but also prepare its people to cope with the rapid changes that new technology causes in their personal lives.

The spectrum of skills is broadening, and varying, and educators must make new trusts stimulating new thinking and new ideas.

There is a growing need to "keep up." Education is often obsolete before the ink is dry on the diploma. There must be ways of retaining and updating skills.

We've come a long way, but human resources are still largely untapped, there is no limit to man's ability and capacity to broaden the horizons and to assign new values.

Remember the resourcefulness of a Sergeant Pryor of the Lewis and Clark party. Clark ordered Pryor along with three other men to take the relay of horses to rendezvous at the mouth of the Yellowstone River. All well and good--except the plan loused up the first night out, when the Indians swiped all the horses. So there Pryor was--unhorsed in the middle of nowhere. Pryor showed a great deal of resourcefulness--he shot a buffalo and made himself a couple of bullboats. Mastering the craft enroute he floated the river to where Clark was waiting, to report that bullboats were better for the river than dugouts.

Today we aren't concerned with bullboats and dugouts but we do need to develop the same resourcefulness as our early citizens showed a couple of hundred years ago so that we meet the needs of today and the unknown challenges of tomorrow.

Ben F. Epps

The Impact Of Technical Education On Economic Development -- The Mississippi Story

Good Morning.

It is a distinct pleasure to talk to such a fine group of people who share the same interests and who dedicate such a major portion of their lives to serving others.

My talk this morning, "The Impact of Technical Education on Economic Development -- The Mississippi Story," covers two, really three, ideas or concepts that are most important to me. These are Mississippi and anything that helps our state, technical education and last, but certainly not least, the economic development of Mississippi. Mississippi does have a story to tell, thankfully, a happy and positive story. It pleases me to say to you that technical education has played a major role in the story, continues to play an important role and will play even a larger role in the future.

I'm sure that you will understand when I use the following terms snynonymously -- technical education, vocational education, vocational technical education or just plain vo-tech. Is it fair to say? All vocational education is not technical but all technical education is vocational. -- Economic development, vo-tech education -- the Mississippi Story.

Mississippi is large in heart but small in population with only 2.2 million people. From 1940 until the 1960's we experienced a population decrease, a negative growth rate in population. The birth rate was declining and our displaced farm workers were leaving the state and looking for employment in the north and west. We were in trouble, we didn't have the jobs we needed to keep our people home. Our population in the 1970 census showed a growth rate of almost 2 percent. We hope that we have stemmed the tide of out migration and will now have a reasonable population growth. I'm sure that you can see that economic development is a matter of survival with us and we take it seriously. Our success in attracting new industry has slowed down this drain of our top young talent and also our former field hands--both of which we need in our state. Our now growing population is 63 percent white and 37 percent black. Mississippians are returning home where their heart has always been.

In land area, Mississippi is neither large nor a small state. We have over 47,000 square miles of coastal land, delta, plains, prairies and a variety of hills and a bunch of pine trees. It is a good days drive from one corner to another. The delta is some of the richest farm land in the nation and we have abundant crops of cotton and soy beans and quite a supply of beef cattle and I hope the price goes up soon.

We are basically a rural state, but not as much as we were in 1940 when we were 80 percent rural. We are now 55 percent rural which is not a bad place to be when you take a look at the magnitude of the nation's urban problem.

I hope that I have given you a bit of a mental picture of this deep south state without burdening you too heavily with statistics. We are average in size, small in population, rich in land and also in heritage, rural in nature, and poor in per capita income---the lowest per capita income in the nation. We have made strides, big strides, but we still have a long way to go.

What about the development of vocational education? How has it developed--what part has it played in the economic development of the state?

Mississippi has been an agricultural state and has had for years organizations to work with the farming community. In fact, farming has become so efficient that it put a lot of people out of work. This put a burden on the industrial sector where no particular help or expertise was available. In the early 1960's, we began to really think seriously about industry needs and how the public sector could lend assistance.

Vo-tech education was one of the agencies challenged to bring a new look to Mississippi's economy. A group of vo-tech educators was assigned the task of developing a "plan for the expansion of trade and industrial and technical education for the State of Mississippi".

Here are some excerpts from this plan, particularly from the first page which set out priorities. The priorities set still hold today. I quote from the plan: "We, in the south, are engaged in an industrial development program such as no section has ever seen before

Industrial development has almost become a by word all over the south. In the fact of what might be called automation on the farm, requiring less people to produce more, and a mass migration from farm to city (one-third of the total population of the state has moved from farm to city in the last ten years), Mississippi must industriaiize if she is to maintain a stable economy. (Remember now that I am quoting from a plan written in the early 60's, some 15 years ago)----the paradox is that with industry searching for trained people, Mississippi has an overabundance of labor -- unskilled labor. Labor that modern industry has little, if any, use for. ---- This brings us to one conclusion -- Mississippi must expand her vocational and technical education program immediately to meet the skill needs of these industries. If we do not, we will be wasting or, to say the least, failing to develop the most important natural resource that this state, or any other state, has -- her manpower. The conservation of these vital resources demand immediate expansion of all phases of trade and industrial and technical education. Operating under the present appropriation, it is absolutely impossible to provide an adequate program to meet the needs of the state. The following information is offered in substantiation of the specific needs for expansion of these programs." ETC., ETC. ---- (end of quote)

Also included in this plan developed in the early 1960's under the Type C (Adult Preparation) section was the germ of what is now known as Mississippi's "Start-Up" Training Program. Again quoting from the plan, "It is difficult to estimate exact returns, but it is quite evident that the person trained would return to the state, in the form of taxes, many times the cost of his training, probably even during his first year of employment. ---- In the case of new or expanding industry, the adult education specialist would work with the development group and provide information as to the operation of the program and assist in determining training needs. Upon determination of training needs, a lead time schedule would be set up and preparations for training begun." ---- The proposed cost for this industrial preparatory program (Start-Up Training) was $90,000.

As you can see, the need for industrial development of Mississippi was critical and vocational leadership in the state was aware of the important role that vo-tech must play in this economic development effort. I am pleased to tell you that today vocational technical education continues to provide start-up and industrial training in Mississippi, of course, on a much larger scale. And perhaps it should be noted that it continues as a part of our regular adult programs. It is completely supervised by vo-tech people and is not a part of any development agency or specially created bureaucracy.

We do, however, work hand in glove with the State Industrial Development Agency, area development groups, Chambers of Commerce, utilities, banks, railroads and any individual or group that is working to further the economic development of Mississippi. I might add here that we don't wait to be contacted by these groups asking for our help. We actively even aggressively sell these groups and existing as well as prospective industry. We do knock on doors to promote our product, even something as beneficial to all as training requires much effort and sell.

Industrial or start-up training in Mississippi is conducted through the junior college vocational centers and the secondary vocational complexes. The state vo-tech division coordinates these activities and funds these programs. Mississippi has its post secondary vo-tech centers on the junior college campus and vo-tech is an integral part of the campus. This concept has helped us effectively upgrade the prestige of vocational education, as a matter of fact, vocational education is so popular in Mississippi today that the academic side of the junior college campus is reflecting in some of our glory. In any event, we do have a happy marriage of vo-tech and academic in the junior colleges.

The facilities of our junior colleges are the primary sites for conducting start-up training for either new or expanding industries. These accommodations are provided at no charge to the company for which we are training.

The equipment at our centers is also available for this specialized training, also at no charge. Now, we don't have a warehouse full of surplus equipment just waiting for some industry to arrive to use it, I'm glad we don't--but we will and frequently do shift equipment between the schools to meet a particular company's need for training. Most companies have specialized equipment and we most frequently use the company equipment for training their prospective employes.

Perhaps I should make this point, we are not restricted to training at our junior college or high school facilities, we will and do train anywhere--at the plant site, in mobile units, in city provided rented facilities or wherever. Mississippi has 26 post secondary area centers and 54 secondary area centers, which pretty well blanket the state, so we are not often required to go searching for an off school site.

A quick aside--we've learned that we get much better trainees or prospective employes for the company in providing this training through the junior colleges. Junior colleges have a lot of prestige and are well thought of by Mississippians, consequently, the association of the new company with the junior college attracts a better than normal prospective employe.

We will provide the instructors for an industrial training program, but in most instances, the instructors are the supervisory cadre for the new plant and in these cases we either pay the instructor direct or reimburse the company for the instructors time spent in training. We do provide a brief "effective instruction" program for these supervisors who will do the teaching. If the supervisors are new to Mississippi, we also provide through our people some tips on motivational techniques, getting along in the new community and on most occasions a 16 hour supervisory training course.

One of the most popular items in our industrial training package is the "tailor made" training program. In Mississippi the Research Curriculum Unit prepares our training materials for the new or expanding company. They work under our direct supervision and have done an outstanding job for us. They visit the company's present facilities wherever they may be located, meet with company engineers, supervisors and management and write the program.

The program is written strictly to meet the company's performance objectives---if the company requires welding on one metal in one position, that's all we train for.

We usually prepare an instructor manual and a participants manual. The manual is detailed and to the point without any rhetoric; it is filled with how to pictures and illustrative diagrams. These manuals are frequently accompanied with videotape which supplement the manual. RCU personnel do the taping in the company's existing plant with our own equipment. They also edit, script and narrate to provide a professional job. This is a typical manual prepared for one of our new industries. The company has complete approval authority over the contents of the manual but we write it, tape it, illustrate it and print it at no charge to the new or expanding company. The quality of what our people are doing has made this one of the distinctive parts of our full circle training package.

The vo-tech start up program will also participate in the cost of supplies consumed in the training. Now, we don't make a carte blanche promise to provide all supplies required. We plan with the assistance of the company and our program writers the requirements and then make the decision on our participation. This is determined by the length of the program, the number of trainees, the skill levels required and last, but not least, the total cost. We frequently will bear the total cost but not on all occasions. The companies that we have worked with find our approach reasonable and financially sound, you know the companies are interested in how well we control costs as they are taxpayers also. We do make a reasonable and definite commitment and in time to allow the company all the time they need to plan.

We are quite proud of what vocational technical education has accomplished in Mississippi, both through its regular programs and its special industrial training efforts. I have talked particularly today about start-up training but our regular programs are the back bone of our efforts and although it is more difficult to measure, these regular programs are our main contribution to the economic development of our state.

Let me summarize just a little bit more about our start-up training program before I close with some exciting facts about the dynamic industrial development of the south and particularly Mississippi.

In the past two fiscal years ended June 30, 1974, we provided start-up training for 33 new plants and 93 expanding ones for a total of 126 Mississippi industries.

More important, 15,282 Mississippians got a job or a better job. Some major national companies have located expansion plants in our statee recently and used our training programs. These include General Motors, Allis Chalmers, Litton, Sperry, Milwaukee Electric Tool, Conoco, Weyerhauser among others. These plants will be the first to tell you that Mississippians are productive, trainable and still have a fine work ethic. They are also willing to be trained on their own time, without any training allowance with the prospect of upgrading their skills to get a better job. We have had no trouble getting our people to take pre-employment training. We pay no training allowances under this program.

One of the major problems we, in Mississippi, have today and have faced for some years is our image. Some national companies have the impression that Mississippi has a vast available labor supply that is top-heavy with unskilled, untrained and impoverished workers. This impression has some validity, however, there are compensating factors that must be conveyed. The availability of sophisticated and comprehensive vocational training schools has enabled employers to upgrade with production workers as required to meet their needs. On the other hand, employers have found it convenient to adapt their requirements and procedures to meet the capabilities of the available labor supply.

Industrialists spent more money in new and expanded industries in the state in the past three years than in the combined total of the previous 27 years. Twenty-eight hundred new and expanding industries invested approximately 2.5 billion dollars in the state from 1944 to 1971. In the past three years alone, 550 new and expanded industries invested 2.6 billion dollars.

Mississippi, historically an agricultural state, has emerged in the 1970's as an economically aggressive part of the new south. Today manufacturing is the number one employer in the state and its major source of income.

We feel that vocational education has played a role in this exciting growth in Mississippi. Thanks for the opportunity of sharing a bit of The Mississippi Story with you.

Ralph C. Kuhli

Economics Of Allied Health Education

As allied health education has expanded from hospital-based educational programs to include educational programs based in proprietary schools, technical institutes, colleges, and universities, each kind of institution has seen this development with mixed feelings of interest and concern. The economics of this development are of critical importance, involving interest in how to get a grant to fund an educational program, and concern for the high costs of allied health education, with concomitant pressures for what some administrators see as disproportionate shares of the budget, faculty, and available space.

Perhaps it would be helpful to have economists review this whole subject and give us a professional analysis of the economics of allied health education and of the allied health occupations. To that end, I propose to try to stimulate interest in the involvement of economists by commenting on five aspects of these subjects:

1. Economy of allied health technicians as specialists.

2. Management for teamwork in medical care.

3. Funding education for teamwork.

4. Economic value of allied health education.

5. Costs of continuing technical education.

Perhaps I should begin by differentiating between the words medical and health. The words medical and health are synonymous and should not be used interchangeably. Much more than medical care is needed to assure the "state of complete physical, mental and social well-being and not merely the absence of disease or infirmity" which is so often quoted from the first sentence of the World Health Organization constitution as a definition of health. (1) Medical care is a part of health care; allied medical medical personnel are part of the total allied health personnel. Physicians, other independent practioners, and allied medical professionals serve together as a medical care team which provides medical services to patients. All Allied health occupations can be considered to include a comprehensive range of professions and services. Those allied health occupations which work with or under the direction and supervision of physicians in providing services to patients are occupations which we in the American Medical Association called "Allied Medical".

1. Economy of Allied Health Technicians as Specialists.

For centuries medical care was provided by the physician. Early in the nineteenth century it became obvious that the patient needed many services which did not require the education and supervised experience it took to prepare a physician, so the profession of nursing developed. Notice that both the physician and the nurse are concerned with the total care of the patient.

Shortly after the beginning of this century, new kinds of patient services were developing, and this called for new kinds of health personnel. X-ray and laboratory tests were evolved, and non-physician specialists were trained to take and develop the x-rays or to do much of the work involved in laboratory tests. Rehabilitation called for occupational and physical therapists and several other allied health occupations. Unlike physicians and nurses, these allied health workers are not concerned with total patient care; such allied health workers are specialists: their education and experience are concentrated in just one part of the total services for patients. By the way, this is why allied health workers can contribute to better patient care; physicians are the first to say that there are certain things which can be done best by qualified allied health professionals. My point, of course, is that it is economical to have allied health professionals who require fewer years of technical education.

Dr. C.H. William Ruhe, Secretary of the AMA Council on Medical Education, explains that allied health professions begin typically with the care of the patient and then work backward into educational institutions. Dr. Ruhe said: "Characteristically, the process develops as follows. First a need is identified at the level of patient care and persons begin to perform a function which fills this need. Generally, this happens because a physician trains somebody to help him with a patient-care task. After a while, the assistant, whether originally a

nurse, an office girl, an orderly, or a high school student working during summer vacation, develops a certain proficiency in his task. He may be hired away by another physician or by a hospital to perform the same task in a different surrounding. The original physician then trains another to replace him and another, and another as the services of such persons come into demand. Eventually, he develops a small school so that several such persons may be trained simultaneously. If the need is genuine and has been identified elsewhere, other training programs spring up.

"As the number of those produced increase, the graduates of the programs associate with each other and form some kind of society. Gradually, they become interested in elevating practice standards in their own field and in improving the training of which their members are produced.

"Usually, the group of physicians in whose special area of medicine the assistants have been trained then get together with the graduates of the programs and agree on certain kinds of standards. Formal statements of minimal educational programs are developed and eventually, if the professional bodies agree on the need and method, review of existing programs is carried out to determine whether they meet the standards.

"Meanwhile, the technical society has grown in size, strength, and number and has usually developed its own set of ethical standards and rules of conduct. Eventually the group usually seeks some kind of registry or certification or licensure with the legal and legislative channels of the various states. In this way, a new profession has been born.

"It is only after many training programs have been in operation for some period of time, and formal educational standards have been developed, that responsibility for these programs is assumed by regular educational institutions. Ultimately, they may become completely based in our traditional education institutions (i.e., our colleges and universities). But initially, the training programs are carried out under individual auspices in doctors' offices or in hospitals or clinics. Later the clinical training and the basic higher education are linked to form a total professions programs."

For each practicing physican there are a dozen other health workers, and this ratio continues to grow as physicians delegate more tasks to non-physicians and the public requests more medical care services paid by insurance. Physicians, nurses and allied medical professionals work as a team in providing the best possible diagnosis and treatment for the patient. Ernest B. Howard, M.D., Executive Vice President on leave, American Medical Association, said it like this in the preface of the AMA paperback book titled Horizons Unlimited:

"The two fields -- medicine and careers allied to it -- are inseparable. They are equal partners working together in a common cause of the highest order -- making life happier, healthier, and more productive for each of us."

It is characteristic of the health professions that we express our love for all mankind by our care for individuals. In many cases, we have a one-to-one relationship: the health professional working with the individual patient. The patient of whom I speak is you or me, multiplied by 213 million other Americans.

Furthermore, each of us is satisfied with only one level of quality of medical care: the care must be provided correctly. For example, when our blood is typed, it must be typed correctly. If someone is repairing something on our car, the worst that can happen is that the part will be wrecked and we have to pay for a new part. Now compare that to the eye -- in certain extreme cases of gross mistreatment, the eye could be destroyed, and money will not buy a new eye. Medical care must be quality care. That is why standards of medical and allied medical education must be maintained for the necessary quality.

Undergraduate medical education prepares medical students for care of the patient as a person: the medical care of the entire individual. Graduate medical education may concentrate on a medical speciality. The continum of medical care consists of undergraduate medical education, graduate medical education, and life-long continuing medical education.

With the exceptions of nurses, medical assistants, and physician's assistants, allied medical occupations consist of specialists in just one component part of total patient care: the electroencephalographic technician is concerned with recording brain waves, the histologic technician is concerned with the minute structure and function of tissues, the medical laboratory technician is concerned with the work of the clinical laboratory, the medical record technician is educated to concentrate on medical records, the operating room technician is a member of the surgical room team, and the respiratory therapy technician is trained to assist with respiratory therapy work. I emphasized that all these allied medical workers are specialists: their allied medical education and work are concentrated for years on their special part of patient care. Thus, they are experts in a particular area of competency, but because their education is concentrated in just one part of medical care we have the economics of just a year or two years of higher education.

Organized medicine is involved in allied medical education because physicians have a responsibility to be helpful in the education of the non-physician members of the medical care team, and because physicians want and need to delegate more patient care tasks to qualified non-physicians. But the physicians need to know that these non-physicians have had the education needed to develop the necessary qualifications. (2)

2. Management for Teamwork in Medical Care.

Education and health seem to become increasingly complex and confusing. Perhaps it would be helpful to start with the right questions.

The first questions to ask is: "What services does the patient need?" That question, and our answers to it, can help us all get our thinking straightened out. Other questions follow, and in logical order:

a. What services does the patient need?
b. What is the most effective, efficient way to meet these patient needs?

c. Can the existing health occupations provide these patient care services most effectively and efficiently?
d. If not, what changes are needed?

Sometimes I think we look through the wrong end of the telescope; we concentrate our attention on what the physician does, or how the university medical center functions, or what we teach a student for an allied health occupation. We will get a clearer picture of what is going on if we will just look through the right end of the telescope to see the patient -- who he or she is, what he or see needs, and what he or she wants (and is willing and able to do) for his or her health.

In allied health we have had weird ideas of who we are and what we think we are doing. Here are just a few examples:

We firmly insist on two-year educational programs and four-year educational programs, but until recently we seemed to think that it is acceptable for first aid to be provided by ambulance drivers and attendants who had an elementary 18-hour course in first-aid--if that!

We seem to think that an allied health professional is someone who works in a university hospital or in some other medical center. We look the other way when the fact comes up that half the hospitals in this country are small hospitals, many of them with a hundred beds or less. And that the employees in these small hospitals must do tasks usually listed in several related allied health occupations. And we seem to just refuse to face that fact that most patients are not even hospitalized. We are obsessed with the Chinese barefoot doctor and the American barefoot patient!

We think medical care is strictly civilian. We don't face up to the fact that more than ten million Americans get all their medical services from the military services. The many military medical personnel are just as much a part of America as the civilians!

You know, 27,580 doctors of medicine are employed by the federal government, and almost twenty million Americans get all their medical care from the government. The Veterans Administration alone constitutes the largest medical care system in the country. If--and I emphasize -- IF -- the federal government has a better way to maintain health and to practice medicine for people who are ill, let the "feds" demonstrate it now with all the medical personnel and facilities already under government control!

Medical care is distinquished for its emphasis on what is best for the patient. For decades the voluntary health agencies have used rehabilitation to visualize service to people: for example, occupational therapists have been photographed helping patients, and the American public has responded by contributing many tens of millions of dollars these past decades. Certainly medical care should be patient-centered.

Emphasis on patient needs concentrates our attention on education for a different future:

A patient-oriented future, in which more millions of people will want and be able to pay for more medical services -- for maintenance of health and for the care of chronic diseases as well as for medical emergencies. Most of these medical services could, and should, be provided by non-physicians -- by allied health professionals, working under the direction and supervision of physicians.

A managed future, in which the principles of good management will be applied to medical care. The patient will know who is responsible for what. It is not in the best interests of the patient for each health profession to determine its own role, separately, and in some ways in competition with other professions. Cooperation and teamwork are required for the best care of the patient.

A changing future, in which new and better methods, relationships, techniques, equipment, facilities, financing, and rewards for productivity will add up to more people getting more and better medical care services.

Management people -- businessmen -- not only know the value of a dollar; they also know the value of a person. Therefore, management for results is concerned largely with people, and emphasis is on how to help each employee--at the management level as well as the job entry level--to be most productive.

A lot of professionals work in American industry, and they are productive as individuals and as members of a business organization, a team. One important principle is that decisions should be made at the lowest level of full competency, rather than only at the highest level. Another important principle is that there is a healthy respect for the competencies of technicians, and for technical education.

Management for teamwork in medical care is needed. Management people can help the health professions to identify who is in charge, who is responsible for what, the economic value or market-place value of various kinds of health services and of the people who provide them, and how to set objectives and measure progress toward those objectives. A business-like approach to medical care could provide better management which would enhance the professional conduct required.

3. Funding Education for Teamwork.

Eagerness for federal funding of educational programs should not blind us to the fact that as much as 90% of the costs of allied health education has been paid by students and their parents, hospitals, communities supporting community colleges, and states supporting state colleges and universities. Allied health education is too important and too permanent a need to be funded primarily by "soft" money. Funding for educational programs should be built like a pyramid, with a strong base of continuing financial support. If this is not available, it is better not to start the program.

Charles G. Richardson, District Director of the Western Wisconsin Technical Institute, wrote his doctoral thesis on a comparison of the costs of various kinds of vocational education. He found that costs were highest for programs like printing, where the equipment is very expensive and the instructors are highly paid. Nursing, on the other hand, was found to be one of the less expensive health education programs because the large size of classes means that the total costs of the

nursing educational program divided by the large number of students equals a modest cost per student.

Too much allied medical education has been tutoring, with classes of one or two, four, six, or eight students! Obviously, we must consolidate classes where some commonality of subject matter can be found, and we must restructure allied health occupations so that the realities of overlapping responsibilities on the job are recognized by revising the curricula of allied health education. Economies of class size and shared faculty can help institutions to cope with the high costs of allied health education. Technical institutes, community colleges, four-year colleges, and universities share and allocate scarce resources, including available funds, faculty, and students.

One aspect of funding which merits more attention is that technical education is -- and should be -- tailored to the job. There is no need for over-education, nor to teach competencies not needed or used on the job. Feedback is needed from the employer, to make sure that graduates of technical education programs know enough to start work at their jobs, and are not disgruntled because they were taught things which are not needed or wanted on the job. Proposals for foundation or governmental grants should include requests for funds to follow-up on graduates so that educators have such information as well as facts about how long graduates work at the occupation for which they were trained. This is a unique aspect of technical education which requires funding, and it is especially suitable for funding by soft money.

Allied health students should be learning to work together, to cooperate, to follow and to lead, to participate in the work of diagnosis and treatment. I think it is a great disservice to students to teach independence when the future requires interdependence. Of course this is as true of medical students as it is of allied health students.

How do you teach teamwork? It isn't easy but it is being done. Dr. Joseph Hamburg at the University of Kentucky doesn't want a separate building for his school of allied health. he has the dental auxiliary students learning with the dental students, with the same faculty and facilities. Continuing education teaches teamwork: heart and respiratory therapy seminars welcome all the professionals -- the people who are going to work together, learn together. Teamwork is a reality in the operating room, intensive care facility, emergency room, and in other settings. We need to identify it, teach it, and strengthen it. Clinical instructors teach teamwork: cooperation among professionals is very good at the bedside, and the practicing professionals teach this cooperation to the students.

The old town and gown dichotomy is the enemy. We have to learn respect for ourselves and for others: I'm okay -- you're OK! The junior college, technical institute, and university must be part of the town; and the town must be part of the schools. We, of all people, should have and teach healthy attitudes of cooperation in an equal partnership.

Once again, the clearest way to see this is to look at it from the point of view of the patient. A fresh perspective is available to us from the management people in industry. They can help us to learn how to manage, set objectives, fix responsibility, cooperate. And they do not have the hang-ups of indoctrinated health professionals.

There are many good reasons why the physician should not try to do everything in patient care. Delegation facilitates better patient care. That is why more physicians are delegating more responsibilities to more qualified non-physicians: nurses and other allied health professionals. No, not "referral". I don't see the physician as a magnet who draws patients for referral as though they are customers. Non-physicians should forget about national health insurance as a money machine for independent practice, using patients referred by physicians. Instead patients need care by professionals who cooperate as a team in shared diagnosis and shared treatment.

When there is a genuine need to carry out a program for which adequate funds from campus sources are not available, you might consider outside funding. For examples: perhaps you have a new idea for a course that needs planning, you need to trace information in your field of specialization and need time and assistance, or you have to attend a meeting and deliver a paper. Official guidelines for writing grant proposals are available, of course, and in addition a small "Guide to Proposal Writing" is available from the American Association of State Colleges and Universities (One Dupont Circle, N.W., Suite 700, Washington, D.C. 20036).

Of course, the Federal Guaranteed Student Loan Program might be considered to be a major resource which could be utilized for funding education for teamwork. Over six million students have borrowed a total of about $6 billion. The proposed requirements and standards published in the Federal Register include a new definition of "student". The new definition permits a student who does not have a high school diploma or its equivalent to obtain a guaranteed student loan to attend an institution of higher education, but only if the institution does not admit more than a small proportion of such students.

The proposed regulations -- which were scheduled to be published in the Federal Register early in 1975 -- specify in Section 177.65 that "Each participating institution holding itself out as preparing students for a particular vocation or trade shall, prior to the time the prospective student obligates himself to pay tuition or fees to the institution, make a determination, based on an appropriate examination or other appropriate criteria, that such person has the ability to benefit from the instruction or training to be provided."

4. Economic Value of Allied Health Education.

The reason that students choose an educational program for an allied health occupation is because they see the opportunity for rewarding service to others. Hospitals have been especially successful in recruiting good people, partly by paying stipends and providing scholarships. The federal government has helped by capitation grants and by funding the establishment of certain allied health educational programs.

Look at the federal funding for MEDEX programs, and for certain programs for physician's assistants. The largest allied health schools in the world are conducted by the military services, and their whole student body is on salary. Foundations have funded students as well as whole programs -- the Duke University program for physician's assistants, for example.

But in a sense all these are exceptions. By far the great majority of allied health educational programs are funded by the institutions which sponsor them, and by the tuition paid by students. They vote with their dollars and their vote is for the values of allied health education.

Hospitals, technical institutes, and colleges want to sponsor educational programs which produce graduates who are prepared to start work at the allied health occupation. Students want and are willing to pay for the education they need to prepare them to start work. This is the hard money which should constitute the financial foundation of allied health education.

I am not completely sold on strident derision of the "pieces of paper": the college certificate, degree, or diploma; the certificate of competency provided by a registry; the license provided by government. The employer has the problem of determining whether or not a job applicant has the education needed to prepare a person to handle the responsibilities of the allied health occupation. That education could and does include what one learns from experience as well as what is learned in formal higher education at a technical institute or college. But it is not easy to really examine a job applicant for a allied health occupation; it takes all the resources a registry has to examine applicants fairly and competently. Such an examination is just too much to expect of an employer who hires people for dozens of different health occupations. So I have a healthy respect for allied health education of the necessary quality, and of the need for some way to certify graduates to prospective employers. It is a play on words to deride that price of paper, when the issue is how to document that students have learned what they need to know to start work at the job.

The economic value of allied health education should not be beneath professional attention. In our free enterprise system, we have ways of attracting competent people to areas of need. For example, how do we get someone up on a windy scaffold to wash windows on a skyscraper? Not by selling idealistic young people on the social values of clean windows. We make the job attractive, one way or another.

There was a time when nurses were expected to help sick people without getting paid what other women earned in other kinds of jobs. Those days are gone, fortunately. Health professionals should be paid what they earn. Health needs in rural areas, ghettos, and other areas of special need should be met by making jobs there attractive. That includes systems analyses, so that the work makes sense (there is little point in providing advice on nutrition to people who can't afford to buy the food, for example); that includes fire and police security, so the health professionals don't get murdered and robbed for drugs; that includes commensurate remuneration; and it also includes budgets which provide for allied health professionals, because physicians and nurses want and need the services of the rest of the members of the health care team.

The economic value of allied health education should be determined by economists, who are paid to give us their views of:

a. Wages and salaries paid to allied health workers
b. Wages and salaries paid to comparable workers in other industries (How unfortunate it is when a competent allied health worker must get out to get ahead!)
c. Economic value of the work done by allied health professionals.
d. Costs of allied health educational programs as related to the total number of years the allied health worker works at the job for which he or she was trained.
e. Economic feasibility and value of continuing formal higher education as a part of employment.
f. Most economic (efficient and effective) ways of providing those patient care services most closely related to other service industries (how to handle the costs of medical emergencies, economics of out-patient care, medical records, paper-work for insurance, employee turn-over, etc.)

Many professional problems involving associations of professionals could and should be resolved with the help of economists and management experts.

5. Costs of Continuing Technical Education.

Much of the work of health professionals is technical, and this work is changing all the time. Therefore, students for the health professions must be taught how to learn, and must become indoctrinated with the idea that they must continue their formal higher education for the rest of their professional lives.

In other words, all health professionals should be going to school as part of their jobs. I think employers -- hospitals, for example -- should employ people to work in the hospital for four-and-a-half days a week, and work as an enrolled student in a technical institute, college, or university the other half-day each week. Life-long continuing education is a part of the job of all health professionals.

Who is going to pay for all this? The costs must be budgeted by all involved:

-- Budgets for higher education should include provisions to provide such formal adult education at the professional level required by health practitioners.
-- Hospital budgets should provide for personnel needs based not on a shorter work week, but a five-day week which includes a half day spent at an institution of higher education.
-- Health professionals should consider formal continuing education as part of the personal costs of working -- like the costs of commuting and of belonging to a professional organization.
-- Patients should understand that it pays to be taken care of by health professionals who keep up-to-date -- who do not allow themselves to get behind in the fast changing technological developments of health care.
-- Taxpayers should understand that continuing education is an essential expense, and a bargain

-- much better than the shorter work week, or care by someone who has let himself get behind the times.

Of course, this poses many problems for technical education: large numbers of health practitioners enrolling for half-days once a week, requiring a high level of up-to-date instruction, and becoming most critical students (e.g., How does this help me do a better job with my patients now?). On the other hand, this challenge is one which should be met by educators and comes at a time when the birth rate is falling and younger students might be decreasing in numbers.

SUMMARY

Obviously all of us need the assistance of economists to explore the subject of the economics of allied health education. In the hope of stimulating interest in the involvement of economists, I have commented on five aspects of this:

1. It is economical to have allied health technicians as specialists who, by the way, need quality technical education in related fields as well as in their own specialty.
2. Management for teamwork in medical care is needed, preferably by cost-conscious management people who can help us fix responsibility in the best interests of the patient.
3. Funding education for teamwork is needed to assure that students are taught interdisciplinary work, how to cooperate, how to lead, and how to follow. This is not a by-product and such education should be funded to assure it is learned effectively.
4. The economic value of allied health education should be determined by economists, who also concern themselves with the economic value of the work done by allied health people, and the costs of their education and employment.
5. The costs of continuing technical education should be budgeted and paid by employers and institutions of higher education as well as by health professionals. All health professionals should have life-long continuing formal higher education as part of the job.

The economies of allied health education is so important that it should be dealt with by economists and management people as well as by educators and allied health professionals. I hope that these comments will help to stimulate interest in giving more attention to this important subject.

The economics of allied health education should, of course, be considered in the larger context of all education for health professions and the larger universe of the economics of health. One of the most recent and best "state of the art" collections of papers on this has been published as the proceedings of a 1973 conference on health economics sponsored in Tokyo by the International Economic Association. (5)

It might also be helpful to remind ourselves that allied health occupations are not always a less expensive substitute for physicians, and that technical education for allied health occupations is not necessarily a free ride obtainable by getting grants from the federal government or foundations. There is no such thing as a free lunch. Reuven Bar-Levav, M.D., of Detroit, wrote it well in his Commentary titled "It's Free" in the January 23th JAMA: "Not so long ago, before we became aware of the ecological crisis, we used to say that water and air were free. This obviously is not true....the assumption that we can let the government pay for something and in so doing lighten our own burden is obviously fallacious. The government is ourselves...." Concerning political promises of free medical care, Dr. Bar-Levav wrote this about similar plans in other countries: "In each and every case, costs have soared and demand for service has risen sharply since it appeared to be free. Moreover, the productivity of health personnel has dropped sharply, increasing the unit cost of each visit." (6) Our challenge is to manage the future so that it will be economic -- more effective and also more efficient.

The American Technical Education Association could be encouraged to provide some national leadership on the economics of allied health technical education, perhaps by preparing a grant proposal to get the funds necessary to employ economists to get the expensive information needed to think about these economic factors. I commend this to your attention.

REFERENCES

(1) World Health Organization, Basic Documents. Geneva, Switzerland; Eighteenth Edition, April 1967. "Constitution" P.1.
(2) Council on Medical Education, Allied Medical Education Directory. Chicago: American Medical Association. 1974. $7.50 a copy; OP392.
(3) Thomas A. Harris, M.D., I'm OK, A Practical Guide to Transactional Analysis. New York: Harper and Row, 1969.
(4) "Guaranteed Student Loan Program", Federal Register. Oct. 17, 1974; Vol. 39, No. 202, Part II, pp. 37154-37161.
(5) Mark Perlman, editor, Economics of Health and Medical Care. New York: Wiley, 1974. 547 pages, $32.50.
(6) Reuven Bar-Levav, M.D., "It's Free". January 13 JAMA, the Journal of the American Medical Association, Vol. 231, No. 2, pp 153-154. For reprints write Reuven Bar-Levav, M.D., 823 Fisher Building, Detroit, Michigan 48202.

William F. Hagan

Manpower Implications Of Environmental Protection

It appears certain that history will record that, aside from the civil rights activities, the environmental movement will be considered the most profound societal endeavor of the twentieth century. This is, of course, conjecture, but the rationale is sound.

History has recorded, however, that land is the foundation for all human endeavor and therefore the foundation for this phenomenon of environmental protection. From the very moment man planted his first seed, or built his first house, or leveled his first road, he realized that land was finite and had to be managed. In addition, he realized that what came from the land and what went back into it, also needed management and protection.

Sadly enough, however, progress precluded wise and prudent management. The growth of the industrial nation, the rise of great cities, and changes in national character overshadowed the inherent cautions of only so much of any one resource. In America, the pioneer spirit became the impetus for entrepreneurial development, which in turn became the industrial ethic and acres of stockyards and factories. The calf on the Texas range became the cow at the Abiline rail head, and then became the meat packed in the Chicago plants for shipment to the East. Hundreds of thousands of miles of railroads and millions of miles of highways gave rise to litter, particulate emissions, noxious fumes and the substance known as smog. Municipal and industrial waste polluted our rivers, streams, and lakes. Indiscriminate use of agri-chemicals poisoned cattle, ruined crops, and in some cases killed people. The growth of a nation has had its perils as well as its benefits.

And yet, the public outcry for relief from these "perils of prosperity" has been heard. The 1960s and 1970s will be viewed historically as the time when man took out the ultimate insurance policy on his survival and the survival of his natural resources. In recent years, the Congress has passed eight major pieces of environmental legislation, all of which are designed to protect the environment through comprehensive pollution control and abatement programs. These enactments are: The National Environmental Policy Act of 1969, The Solid Waste Disposal Act of 1965, The Resource Recovery Act of 1970, The 1972 Amendments to the Federal Water Pollution Control Act, The Federal Insecticide, Fungicide and Rodenticide Act, The Public Health Service Act as amended, the Safe Drinking Water Act of 1974, and the Clean Air Act of 1970.

Significant as these pieces of legislation are, and even with their high and lofty goals, they will not cure the sicknesses and disturbances of environmental indigestion by themselves. For just as land is the foundation of human endeavor, man and his labors are the predicates of the land. Without men and women, good men and women, to make these enactments work, environmental protection and preservation of our land and resources is doomed to dismal failure.

In 1973 over 43 percent of all environmental legal actions at the State and local levels were in the area of land use. Yet our public attorneys' offices remain understaffed in many cases and are often outgunned by high-priced technical experts. A recent survey prepared by McManis Associates of Washington, D.C., for the Environmental Protection Agency, attempted to determine the educational and training requirements of State and local attorneys, judges, and law enforcement officials with respect to environmental enforcement activities. The survey report indicates a veritable bottomless pit need for education and training in these areas which are critical to the success of the environmental programs. These requirements emphasize the need to mix the science with the law in order to effect a blend of justice equitable to the science, the law and the economy.

This wave of environmental legislation produced in the 1960s and 1970s places the bulk of implementation responsibilities upon the States and their subdivisions. States must embark on comprehensive environmental quality control programs in the areas of air, water, wastewater, solid waste, noise, pesticides,

and radiation. In order to achieve both the long-and short-range objectives, these programs require an adequate, skilled work force which can meet the demands of new technology, more stringent standards, uniformity of treatment, and certification of compliance and performance. This work force must be developed in both the public and the private sectors and at all professional and subprofessional levels.

In general, it is when the responsibility for compliance with the legislation reaches the actual point of implementation, i.e., when a man must perform a particular task of a technical nature, does the skill deficiency or the inadequacy of numbers of workers become most apparent.

Some brief examples are:

1. Under the National Pollution Discharge Elimination System called for in the 1972 Water Amendments, States and localities are required to become self-reporting with respect to discharges and effluent quality. The outgrowth is an extreme shortage of a) lab facilities, b) qualified lab technicians, c) operators qualified to take and analyze samples, and various other personnel problems in the reporting chain.

2. Under the 1972 Amendments to the Federal Insecticide, Fungicide, and Rodenticide Act, States will embark on certification programs for applicators of restricted-use pesticides. These programs must be in place by October 1976. The implication here is that a possible 2½ million farmers and over 100,000 commerical pesticides applicators will have to be trained and certified under State-operated programs. At the present time there is not available a sufficient number of trainers or instructors to meet this demand. Nor has an adequate delivery system for training and certification been set in place.

3. What used to be known as the city or county dump has either been shut down or converted to a sanitary landfill. This transition to landfills has, of course, placed a demand for increased skills of solid waste managers and landfill operators in equipment operation and maintenance, landfill operation, vector control and the like.

The technological advances being made on behalf of resource recovery also place an additional load on State and local governments to ensure an adequate well-qualified work force.

4. The Clean Air Act of 1970 has had its greatest manpower impact on the professional and subprofessional technical ranks of the manpower universe. Qualified scientists and engineers must be produced to advance the State of the Art in air pollution control while the technicians are needed for day-to-day operations and maintenance of air pollution control facilities, laboratory facilities, inspections, and automobile emission systems maintenance and repairs.

5. Since it is so young, the full manpower implications of the Clean Drinking Water Bill may not be felt for some time. However, you can be sure that advanced operations and maintenance of facilities as well as advances in the technology will have significant impact on present water supply work force and thereby create the need for upgrade training and professional development.

We could then ask, what is the nature of EPA's commitment to ensuring a steady supply of qualified pollution control personnel at the State and local levels?

From this vantage point, the Agency perceives that the States and localities are faced with the problems of manpower supply for, and the personnel qualifications of those already employed in, environmental occupations. In other words, we are concerned with providing new-entries to these occupations as well as upgrading the skills of those who occupy positions within the State and local environmental agencies.

Over the last four years, EPA has, in cooperation with the States come up with some pretty hard data regarding the number of people who will be needed to keep the environmental work force at operating levels and what type of occupational development and training will be needed to keep the environmental work force at operating levels and what type of occupational development and training will be needed by those in the system.

In formulating this data many questions were asked regarding the capability of the free market system to supply trained and qualified men and women to carry out these enormous legislative mandates. The answer I come up with is a qualified "maybe." Maybe for the following reasons:

1. State and local agencies, especially environmental and public works agencies, in many instances, simply do not have the budgetary wherewithall to accommodate these increases in responsibility.

2. Many of our educational institutions are not addressing the environmental problem from a standpoint of producing capable people, but rather, provide more emphasis on environmental appreciation which, on the open market provides few job skills. What essentially is lacking is a coordinated effort with industry to ensure an adequate quality personnel flow.

3. Without Federal, State, and local cooperative action with existing delivery systems for manpower supply and skill development through vocational/technical education, the free market system will accommodate only the private, profit-oriented, sector by taking the good people out of public services where the bulk of environmental protection is.

To day, EPA has made some fairly significant contributions to the deployment and utilization of an environmental work force. There is much left to be done, but I think that we should highlight our accomplishments in order to provide a track record for the directions we will taken in the coming years.

EPA's statutory authority to undertake manpower development and training programs varies greatly among the several environmental disciplines. It can be said that there are explicit authorizations in each piece of environmental legislation, but the newer pieces, (with the ex-

ception of the 1972 Water Amendments) are rather vague and less specific with regards to actual manpower and training activities.

Given legislative authority to promote, develop and conduct training and education programs, the Agency has attempted to comply with not only the law but the intent of the Congress, plus additional commitments to utilize externally funded employment, training, and educational programs under such legislation as CETA and the Voc Ed Act.

In this respect, EPA has, since 1969, cooperated with the Department of Labor and the Department of Health, Education, and Welfare under the auspices of several interagency agreements for categorical program funding, to develop and set in place an adequate mechanism for the delivery of manpower and support services to those employed in the subprofessional environmental occupations. Over $15 million has passed from DOL and EPA to State and local agencies and institutions of higher learning to assist States in developing manpower and training capabilities utilizing such programs as MDTA-OJT, institutional training for the disadvantaged, Work Incentive, Military Transition and Public Service Careers, Plan B. These programs are in addition to the EPA-funded Direct Training Short Courses, grants under the several pieces of legislation for both pilot and demonstration programs and the university fellowship and academic training grants programs. The approximate cost of the EPA-funded activities for this time period is over $20 million.

Over 10,000 persons in the several subprofessional disciplines have received training under our interagency programs. Of the 10,000 over 3,000 were new hires, many were disadvantaged, and over 1,200 were veterans from the Vietnam era.

Over 10,000 more received upgrade training under the F.W. P.C.A. '72 Amendments and the Direct Training Short Courses for Air and Water Programs.

EPA's professional academic training and fellowship programs have reached still another 10,000 professional career environmentalists.

The course offerings for all these programs range from wastewater treatment orientation to sampling and identification of pollen and fungus spore aeroallergens...from pesticides applicator training to membrane filter methods in treatment plant operations.

In essence, the EPA's manpower development and training program can be characterized under four separate headings:

1. Subprofessional/technical skill training primarily utilizing external resources, such as

2. General employee upgrade training provided by internal funding sources under the several pieces of legislation.

3. Direct training short courses conducted primarily by EPA personnel at the NERCs and regional offices for State, local and private agency personnel.

4. Academic training grants and fellowships for professional career environmentalists.

As substantial as these efforts are, they have only addressed a small percentage of the total needs in the environmental manpower needs. Between 1974 and 1976, the total upgrade training needs for both public and private sectors combined, including all environmental categories, was estimated to be slightly over 2 million student-weeks.

For the same time period, the total new-entry personnel needs for all sectors and in all categories reached approximately 550,000.

Now the bad news! The interagency programs formerly funded by the Department of Labor and HEW have ceased. They have been preempted by the manpower revenue sharing concept as legislated by the Comprehensive Employment and Training Act of 1973. EPA has been told by the Department of Labor that any funding of environmental programs under CETA would be at the discretion of some 403 (437 in FY-76) prime sponsors at the State and local levels who received 1.9 billion dollars in employment and training funds in 1975 and will receive the same amount in 1976. The minimal amounts of money available from EPA to do upgrade training has to be supplemented by other sources. CETA has no provisions for upgrading of State and local personnel nor do we see it being substantially changed in the near future.

The EPA academic training grants and fellowships programs, have a dubious future at best. EPA has for the last several years attempted to keep these activities solvent but the prognosis is not good beyond FY-76.

The Direct Training Short Course programs are faced with a very restrictive tuition fee policy which would preclude the participation of a good number of State and local agencies if it were strictly adhered to. These State and local agency personnel need this training the most and are the least able to pay for it.

What we are approaching then, due to the decategorizing and decentralization of Federal human resource development funds and the disengagement on the part of EPA from full scale manpower development and training programs, is the point where we at EPA must devise the ways and means to effectively manage the system for delivery of those programs in order to ensure that they address the environmental occupational growth and development needs of State and local agencies. Over the long haul, we feel that public employment programs and special revenue sharing programs may be able to meet the manpower supply needs for subprofessional new-entries, and that the vocational/technical educational system, including vocational agriculture, may be able to meet the bulk of State and local upgrade needs. What remains in terms of training needs we hope can be covered by direct EPA funding and by assisting States and localities develop the capability to deliver environmental manpower development and training programs, and insofar as possible, institutionalize them within their existing delivery mechanisms.

It is, therefore, the policy of EPA, under the current limitations, to emphasize the utilization of human resource develop-

ment agencies and programs to meet environmental manpower needs...to work with the States to meet the Agency's highest priority objective, which is full partnership with State and local governments. This means "to provide sufficient technical, administrative, training, and financial assistance to State and local governments to ensure that they are able and willing to accept major responsibilities in all our program areas."

To this end, EPA sponsored the National Environmental Manpower Planning Conference held in Phoenix, Arizona, in December 1974. The purpose of this Conference was to acquaint State and local agencies with the possible resources available for environmental manpower and training programs under CETA and the Vocational Education Act.

EPA has, through its Headquarters and Regional Offices, provided technical assistance to State and local agencies regarding CETA, so that I can report to you that as of January 1, 1975, over $15 million from Titles I and II of CETA has been earmarked by prime sponsors for environmental employment and training programs.

Within the next few weeks, we hope to consummate an interagency agreement between EPA and the U.S. Office of Education which we hope will provide limited funds from both Agencies to demonstrate the feasibility of utilizing the voc/ed system for upgrade and new-entry training. Again, for the long run, we view the Federal/State vocational education system as being the final solution to the new-entry and upgrade training needs generated by environmental protection programs at the subprofessional level. In this regard, our emphasis will be placed on the areas of curriculum development, teacher/instructor training, continuing and adult education, postsecondary environmental education, and Federal/State linkages for continuation of program and technical assistance.

It is our hope that, through these efforts we may be in a position to impact the planning cycles, over a five year period, of those State and local voc/ed systems which would accommodate and continue to program for the occupational development of professional and subprofessional technical personnel engaged in environmental protection.

Further, we will continue to work toward ensuring that the Nation's universities and colleges give proper consideration and direction toward implementation of meaningful environmental programs.

Finally, a word about myths. A myth, according to one of Funk and Wagnalls' definition, is "a collective opinion, belief or ideal that is based on false premise or is the product of fallacious reasoning". There has been one hell of a lot of mythology generated by the environmental movement much the same as was generated by the civil rights movement. Primary among these fallacies is the notion that environmental protection is highly inflationary and bad for the economy.

In a recent study by Chase Econometrics it came out that the contribution to the rate of inflation by environmental protection programs was two-tenths of one percent for the period 1973 to 1982. In addition, for each $1 billion invested in construction of municipal treatment facilities over 20,000 on site-jobs are generated, not including those generated by manufacture and transportation of goods and materials. With a construction grants program which approaches $17.5 billion (14 Federal, 3.5 State, and local), the jobs generated will be in the neighborhood of 350,000 in directly financed activities. As Administrator Train told Senator Proxmire's committee, "There is simply no evidence that environmental requirements have had or will have a marked adverse impact on jobs or existing productive capacity."

We arrive then at the opportunity which I believe will not present itself in such a clear and concise manner again in our lifetime -- that is to provide the necessary technical and executive leadership necessary to ensure that we devote our human, financial and technical resources to the preservation and protection of the environment. You, as educators and administrators, have the opportunity to ensure that not only the Federal program continues, but rather, the whole academic and occupational development community responds affirmatively to this challenge. EPA has done some pioneering spade work, but it is up to the educational system at the State and local level to reassess their priorities and allocate their resources in a manner which will accommodate what I consider to be the Nation's top three priorities, 1) energy conservation and development, 2) increases in our productivity, and 3) protection and preservation of our natural resources. We will assist you in whatever manner we are able consistent with our mission and authority.

Ed Foss

Manpower Needs For Environmental Protection -- Water

Mr. Chairman, ladies and gentlemen, the theme for this 12th Annual Clinic lends itself most appropriately to the subject of my address.

The challenge, as well as the necessity for developing human resources capable of meeting the technical occupational needs required for the protection of earth's water environment has never been more timely.

I would like to digress for a minute or two and briefly familiarize you with this unique medium, water, along with some relevant facts, so that you may better understand and appreciate the need for its present improvement and its continued protection in future years.

Water is, unquestionably, our most valuable natural resource. Yet, we continue to abuse it and treat it as if it were inexhaustible. In slightly more than 350 years we have, with very little effort, managed to pollute practically all of the water in these United States, a very unenviable accomplishment. How did we allow this to happen?

Consider the demands we make upon our limited supply of water. Today's population of 200 million people, an increase of 50 million since only 1950, uses (and misuses) 387 billion gallons a day. Industry and agriculture by themselves account for 354 billion of these gallons. This amount is expected to increase to 494 billion gallons a day by 1980. Ironically, it is these same industries and agricultural pursuits that are largely responsible for the present conditions of the country's water supply, along with our cities and towns, having accomplished this ignominious feat by careless and illegal dumping of waste products, by poor irrigation and use of pesticides, and because of inadequate and poorly managed waste treatment facilities. These actions, in and of themselves, imply ignorant and negligent past use and conservation of water resources at all levels of our social structure. Existing environmental conditions are the indicators of grossly inadequate technical management of our water resources up to and including the present. Obviously, there is ample room for improvement and growth.

Trained manpower, in sufficient numbers, capable of applying its technical skills to these problems, has never been much more than an ideological dream in this country. Simply stated, water resources, pollution abatement and conservation measures have taken a back seat while demand for water has continued its rapid upward spiral over the years. The net result is dirty water everywhere, with the inevitable and shocking realization that the day of reckoning has arrived. Considering only the two areas of water improvement and pollution abatement, there is already a shortage of qualified support personnel in the related technical occupations. The country needs manpower today just to bring the quality of its water back to normal, without even considering future use and protection demands.

Water Improvement and Pollution Abatement.

Many two-year vocational technical institutes and community colleges are already conducting programs or are developing new programs that are designed to provide qualified technical support personnel for occupations in areas directly and indirectly related to water improvement and pollution abatement.

The Federal Water Pollution Control Act of 1972 proclaims two general goals for the United States:

(1) Wherever possible by July 1, 1983, water that is clean enough for swimming and other recreational use and clean enough for the protection and propagation of fish, shellfish, and wildlife.

(2) By 1985, no more discharges whatsoever of pollutants into the Nation's waters.

This is a strong commitment to end water pollution to the greatest degree possible, and the Act itself establishes the machinery and financial support required to accomplish this end. It further implies a great demand for diverse qualified support personnel in environmental protection.

Present Manpower Requirements

Dr. Walter Brooking has

very aptly defined several categories and specific kinds of related supportive personnel requirements that can be expected to be essential in the near future. These were described in his presentation at the 1970 National Clinic on Technical Education in Miami Beach. I take the liberty of including several of these with the following:

Biological Technicians
Biological Laboratory Technicians
Chemical Technicians
Nuclear Technicians
Physical Oceanographic Technicians
Scientific Data Processing Technicians
Freshwater Fish Culture Technicians
Agriculture Chemical Technicians
Marine Life Technicians
Marine Technicians
Marine Laboratory Technicians
Water Conservation Technicians
Pollution Control Technicians
Sanitation Technicians
Estuarine Technicians
Environmental Technicians

Each of these kinds of technicians is already or will soon be needed in occupations closely interwoven with environmental protection of our water supply.

As our population continues to expand, new kinds of pollutants will also appear, water will be in greater demand, and accompanying new technologies will create an even greater diversity of special occupations. Impure drinking water, due in part to improper treatment, today causes over 4,000 cases of water-born disease, including typhoid and salmonellosis. This could become a major problem of this decade as we turn to new sources of polluted raw water and accelerate the reuse of water. The problem exists because an estimated 5,000 of this Nation's community water systems in smaller communities are deficient. They were not designed to cope with today's raw water supply. Furthermore, the 1969-1970 Community Water Supply Study, a field inspection and evaluation of 969 community water supply systems, conducted by the Department of Health, Education and Welfare, disclosed that 77% of the plant operators were inadequately trained in water microbiology and 46% were deficient in chemistry related to their assignment. In a paper prepared by the League of Women Voters Education Fund, published this past year with money provided by the Office of Water Programs of the Environmental Protection Agency, the need for well-trained, qualified personnel to construct, operate and monitor water supply systems is emphasized. The paper goes on to explain that proposed federal legislation would provide the necessary funds to train these technical personnel. The Agency has already funded several training programs in this country. Last summer, for instance, Tufts University and Oregon State University conducted environmentally oriented institutes for faculties of institutions that train technicians for the environmental field. These courses were intended to increase awareness of opportunities in the field. EPA also funded the New England Interstate Water Pollution Control Commission for establishment of an in-the-field training program for waste water treatment operators. Clemson University Sanitary Engineers, led by Dr. John Austin, have used Agency money to develop several highly innovative courses in waste water technology, several of which have since been adopted for use by three technical schools in the Southeast to train students to meet the increasing demands for water treatment support personnel.

The U.S. Department of Labor recently indicated that at least 45,000 waste treatment plant operators will be required in this country by 1980.

In 1972, the Environmental Protection Agency funded and participated in one of this country's most ambitious water improvement programs. The International Field Year for the Great Lakes, a joint international venture entered into by this country and the Canadian Government to study the extent of pollution throughout Lake Ontario as a basis for establishing guidelines for water improvement of the Great Lakes, was a project which represented more than just a scientific expedition. Training of two year technicians for future work in environmental protection was included as an integral and important feature throughout its duration. The research training vessel ADVANCE II and students of Cape Fear Technical Institute's two year Marine Technology and Marine Laboratory Technology Programs were involved throughout in a unique large scale cooperative institutional work-study programs. Many of these same students who performed support work aboard ship and in the Agency's Rochester, New York laboratory have since graduated to positions with companies conducting environmentally related surveys on this country's rivers and streams.

Future Manpower Requirements

Proposed nuclear power plants, offshore oil drilling, deep water port construction and maintenance, coastal engineering, coastal zone use and management, continental shelf exploration and exploitation, undersea technology, marine construction, submarine geology, submarine archeology, oceanography, limnology, marine fisheries, aquaculture, and marine biomedicine are but a few of the innumerably water-related activities that already require and will most certainly increase the necessity for protection of the water environment in future years. Let's consider proposed nuclear plants and the impact these will have on future requirements for trained support personnel. A report of the Southern Governor's Task Force for Nuclear Power Policy, presented in 1970, outlined that electrical power demands for the 17 state region would quadruple by 1990. By the end of this present decade, nuclear reactors are expected to account for 23% of the power generation capacity for this region. This means that there will be between 50 and 60 power reactors in operation. 29 of these are already under construction or committed to be built. Each one will use water in the cooling process in tremendous quantities, water which must ultimately come from and be returned, virtually unchanged, to the environment. Regulation and control of this process alone will require continuous surveillance and assessment. One of the principal recommendations of the task force was the encouragement of technical institutes to enlarge their curricula where necessary to provide specialized training as

the number of these facilities increases. Such a request has already been made by my own institution. Related additional manpower needs would be generated because these plants, nationally, will be required to provide their own water treatment facilities to prevent endemic pollution from several sources.

It isn't necessary for me to continue to describe in detail each activity and its individual manpower requirements relating to the protection of water. I believe this point has already been made. The future demand for technically trained support personnel can only grow in proportion to our increasing dependency on water. Otherwise, we will never reach the goals established by the Federal Water Pollution Control Act of 1972, and the quality of our water will continue to degenerate to critical levels.

SUMMARY

To summarize, because of past deficiencies, lack of foresight or whatever, there is a current increased demand for trained manpower to complete the formidable task of returning our water to its original condition. There is also the added responsibility of continuing to provide increased quantities of this water to a growing population, all the while being responsible for maintaining its quality. In addition, there are many newly developing areas of water-related technical activity that will need to be taken into account. Each one of these new developments can be expected to generate considerable demands on technical education for support personnel in occupations closely related to the protection of water. We not only must, we will meet this great challenge.

Thank you.

B.W. Saterlee

Manpower Needs For Nuclear Energy

Dwight Eisenhower, in a speech before the United Nations in 1953, pledged the United States "To devote its entire heart and mind to find the way by which the miraculous inventiveness of man shall not be dedicated to his death but consecrated to his life." With these words President Eisenhower launched the "Atoms for Peace Program" and committed the U.S. and the free world to the goal of peaceful development of atomic power.

Developments in science and technology over the last quarter century in medical research, the exploration of space and the utilization of the computer are indeed a testimony to the inventive spirit of man. Great studies have also been made in the development of peaceful applications of nuclear power. As President Eisenhower dreamed, energy from the atom is playing an increasingly important role in our way of life.

My purpose today is to describe the nuclear industry, to make some projections regarding its future growth and, perhaps most important for this meeting, to comment on the levels of trained manpower that will be required to support this growth.

The nuclear industry includes both government and private sectors. Within the government sector various agencies and their contractors are involved in activities related to weapons research and development and production; regulation of the entire industry from the safety and physical security of nuclear materials standpoints; and R&D activities pertaining to non-military nuclear applications such as the breeder reactor. The Nuclear Regulator Commission is involved in the establishment and enforcement of safety standards and licensing of nuclear facilities. The Energy Research and Development Agency conducts energy research and feasibility studies regarding new energy sources, including the breeder program. The work of both of these organizations was formerly embodied in the Atomic Energy Commission.

The federal government also operates facilities for the enrichment of nuclear fuel for commercial generating stations and is involved in generating and distributing electricity through government-owned Tennessee Valley Authority.

The private sector of the nuclear industry is involved in the development, design, production and operation of all commercial applications of the atom from medical isotopes for use in disease research and therapy, to nuclear reactors for power generation.

The business organizations involved in the design, development, and operation of nuclear power generating stations make up the largest portion of the private sector of the industry. These organizations include nuclear reactor and fuel manufacturers, architect/engineering firms, constructors, technical consultants, and the commercial utilities themselves.

A survey of occupational employment conducted by the Bureau of Labor Statistics for the Atomic Energy Commission in March 1974 shows total employment in the nuclear energy field to be approaching 180,000 divided fairly equally between the government and the private sectors. Interestingly, however, the private sector shows rapid growth in the numbers of engineers, scientists, technicians and nuclear reactor operators employed, while employment in government-owned facilities has decreased. According to the BLS there was a drop of 10,000 in government-owned facilities between 1971 and 1973 while private nuclear industry employment rose 24,300 to take the lead for the first time in total employment.

Based on the increasing world demand for electrical energy, and the increasing scarcity and high cost of fossil fuels, growth in the commercial nuclear industry seems certain to continue. Over the last 50 years demand for electrical energy has increased at a rate of about 7% per year. To visualize the significance of that figure, consider that a 7.2% annual growth rate represents a doubling of energy demand in one decade.

All indications are that demand for electric power will continue to grow at a somewhat similar rate for the remainder of this century. While there recently have been some forecasts of significantly lower rate of load growth, part-

ly due to energy conservation efforts, this would appear to be a short term phenomenon. When the realities of the situation are analyzed, the inevitable world population increase, the growth plans of our society and the world in terms of industrial production, transportation, housing, and jobs all translate to energy. It is very conceivable that electric output in the U.S. alone could reach 11 trillion kilowatt hours by the year 2,000--that's five times the total installed capacity today.

To meet this increase in demand, it is estimated that by the year 2,000 43% of the world's installed electrical generating capacity will be nuclear as contrasted with 5% today. In the U.S. alone, nuclear generation is expected to increase from 4% of total capacity to 20% by 1980 and over 50% by 2,000. Dominant incentives for this growth are the favorable economics of the nuclear fuel cycle compared to fossil fuel, and the shortage of oil and natural gas. Federal government projections of 1982 fuel costs for 1000 MWe plants starting up in that year indicate that coal will cost approximately twice as much as nuclear fuel. And the projected price and availability of oil at that time will make it an economically impractical fuel for base load generation.

Although capital costs for nuclear power plants are somewhat higher than for fossil plants, total generating costs associated with nuclear plants are lower due to less costly fuel. This translates into lower rates for users served by nuclear utilities. For example, one northeastern utility recently told its customers of a 19% reduction in the fuel cost adder when a nuclear generation station went on line after being down for refueling and maintenance.

In terms of reliability, the performance of nuclear plants to date has been very good. Comparisons of nuclear and comparably sized fossil plants show them to be about equal based on their relative availability to generate electricity. The United States' most experienced nuclear utility, Commonwealth Edison of Chicago, has reported that for 1973 its four large nuclear units averaged 82% availability compared to 69% for its coal fired units.

As for safety, nuclear plants have successfully met very stringent and escalating safety requirements. Extraordinary emphasis on safety dating from the industry's beginning has sustained nuclear power's outstanding worldwide safety record. Despite the fact that the industry is relatively young and the technology complex, there has not been a single nuclear related fatality or injury to any member of the public as a result of commercial nuclear plant operation.

Based on this track record of safety and reliability, and offering an economically attractive solution to the world's growing energy problems, the commercial nuclear industry would seem destined to continue experiencing fast growth. A controversy continues to rage, however, between those that expouse nuclear power and a relatively small but vocal minority that feel the risks are excessive. That there is risk involved, as is the case with all endeavors of us humans, is true. What is important to understand is that the risks are manageable, and that the probability of an extremely serious or catastrophic occurrence is no greater than for other comparable risks that are routinely accepted by society. How many of us, for example, concern ourselves with the risk that a meteor will strike a major population center? Yet that risk is roughly equal to the risk of a major nuclear accident.

The end of this decade may well be a long way off. The reality of the matter, however, is that as operating nuclear plants continue to generate electric power safely and inexpensively and it becomes more clearly evident that no environmentally or economically superior alternative energy source exists, nuclear detractors will face a continuingly more difficult task in attempting to block the construction of additional nuclear generating facilities. So, short term aberrations notwithstanding, the commercial nuclear industry seems destined to continue its growth while playing an increasingly more important role in achieving the energy independence goals of our nation. Quite to the point of my subject today, this growth will require a continuing input of additional trained manpower.

Let us look then at the manpower situation in the industry. Since I speak to you as a representative of a vendor, supplying nuclear steam supply systems and nuclear fuel, I will limit my comments concerning manpower to only the portions of the industry engaged in activities related to commercial power generation. As we've said, that is where the major growth is occurring.

First, keep in mind that based on current experience, a schedule of up to ten years is required for a nuclear generating unit from site selection through construction, licensing, and commercial operation.

A ten-year construction schedule and a price tag of nearly a billion dollars, for a twin unit nuclear station totalling about 2,000 MWe adds up to a formidable project. As for manpower requirements to build new plants, a recent American Nuclear Society survey points out that an additional 1,020 engineers and technical persons and 925 non-engineers will be required to meet the combined staffing schedules of the utility, A'E, reactor and fuel vendor, etc for each new nuclear power plant that is built.

To understand the manpower challenge facing the nuclear industry we must relate these single plant needs to the projected industry growth during the balance of the century. President Ford, in his recent State of the Union address, outlined a program to deal with the nation's energy problems which envisioned 200 nuclear power plants in operation by 1985. If a goal of this type is to be achieved, utilities, their suppliers, etc., will have to recruit and train sizable numbers of additional persons - engineers, technicians and others. According to the ANS survey, almost 17,000 engineers and 21,000 non-engineers must be recruited and trained by utilities and other nuclear industry organizations in the next decade to meet industry requirements.

One could, of course, debate the accuracy of these projections insofar as the absolute numbers are concerned. But the major thrust-that a great many trained persons are going to be needed over the next several decades-is inescapable. There are jobs now available in the nuclear industry and jobs will continue to be available in increasing numbers in a variety of technical and support functions as

design and construction work gets under way for additional nuclear plants.

With these significant manpower requirements in mind, let us consider the traditional sources of manpower.

The nuclear industry has relied upon three principal sources of manpower to support the design, licensing, construction and operation of nuclear power plants:

1. Employees of utility companies and other industry participants who are reassigned to nuclear activities;

2. The military, mainly Navy nuclear trained personnel, and;

3. Persons recruited from universities, community colleges, technical institutes and the like.

One of the problems the industry faces is that these three main sources of manpower in the past are likely to provide insufficient manpower in the years ahead.

First, the number of conventional power plant personnel available for assignment to nuclear activities will be limited, as many of the best qualified individuals have already been reassigned, so, this source will be harder to tap.

Secondly, the availability of experienced Navy nuclear trained personnel is likely to decline, as the military is facing severe budgetary restrictions and is placing much more emphasis on retention of its trained personnel.

Finally, there are also concerns about the inputs available from universities and other educational sources. Results published in Engineering Education magazine in 1974 revealed that the number of four-year engineering degrees granted in the U.S. is declining, and based on current enrollments will continue to decline in the next four years. Engineering Education reports that in one recent year only 324 persons received BS degrees and only 387 received MS degrees in nuclear engineering in the entire country. Mechanical engineers and electrical engineers who have taken nuclear engineering options or courses are also well qualified for positions in the nuclear industry, but their numbers are also relatively small.

I do not want to leave the impression, however, that all positions in the nuclear industry require special nuclear training. In my own company, for example, only a relatively small portion of the work requires the training of a nuclear engineer. Other engineering disciplines are required in great numbers, particularly mechanical engineers for much of the work is component design of pumps, valves, piping systems, and other hardware. Nevertheless, it is true that if more nuclear trained technical persons were available, their skills could be well utilized within the industry. The Engineering Manpower Commission reports that after considering those that enter graduate study and other correction factors, approximately 800 nuclear oriented engineers enter the job market per year to meet the projected BLS demand of 1,700 per year.

We can conclude then that the nuclear industry is facing a manpower shortage that could inhibit achieving the country's nuclear power goals unless corrective steps are taken.

What are some of the steps that we in industry and you in the academic community might take to assure an adequate flow of properly trained individuals into the growing nuclear industry in the years ahead?

First of all, we must step up efforts to encourage young men and women to pursue technical curricula. We must put to rest the notion, fostered largely by the highly visible volatility of certain industries such as aerospace, that engineers are in oversupply, and likely will continue to be in the years ahead. The fact is that the high technology growth industries, of which nuclear is only one, are going to require a large, continuing input of technically trained people over many years. It is ironic that the current recession, as in previous ones, many positions remain difficult to fill while so many persons are unemployed. For example, I live in a densely populated county where the unemployment rate now exceeds 9%, yet many employers are regularly advertising for engineers, technicians, machinists, and other skills. So, I believe our joint objective should be to match as best we are able the output of educational institutions with the requirements of the industrial community and that clearly means increasing the numbers of individuals in engineering and other technical curricula.

In this connection, special emphasis must be placed on achieving a dramatic increase in the numbers of minorities and women pursuing a technical education. I won't take time this morning to go into the data - hopefully you are aware of it. Suffice to say, the current and projected near term output of minorities and women from engineering and technical schools is alarmingly low in relation to the targets of employers as they strive to meet EEO goals and obligations. I can say with complete assurance that qualified, technically trained minorities and women - especially engineers - will be in high demand for years to come. So I urge you to encourage such persons to consider engineering or other technical programs which can lead to very rewarding careers.

Returning more specifically to the nuclear industry, I suggest that efforts to understand more thoroughly just what the market needs are - particularly in the geographic area served by your own institutions - would be productive. I understand that most of you represent two-year, technically oriented institutions. Undoubtedly, some of your students will go on to obtain an undergraduate degree at a four-year college or university, and, as we've said, hopefully you will be able to steer many of these persons in the direction of an engineering education. But what about those who enter the labor market after two years of college?

Are you fully aware of the potential opportunities at your utility company who may be operating or building a nuclear generating station; at an architect/engineering firm with its headquarters or a branch in your area; at a service company in your area serving the nuclear industry; or possibly at a private or government laboratory engaged in nuclear work? As the industry grows, jobs for individuals with associate degrees will be available in quality con-

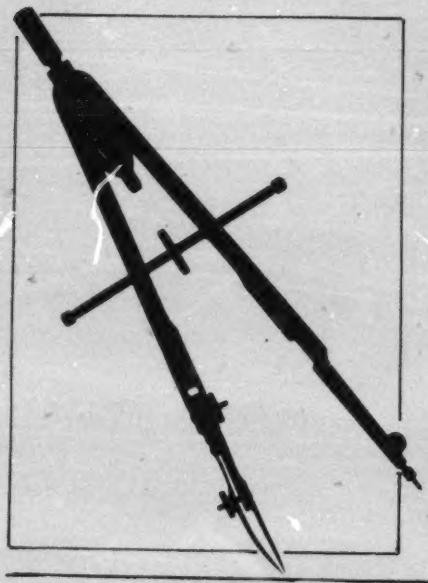
trol, health physics, safety and other fields. The ranks of the licensed reactor operators will also have to grow as more nuclear power plants are placed in service. Associate degree holders with backgrounds in engineering or science could be enrolled in training programs designed to qualify federally licensed reactor operators.

As you explore the potential nuclear market with utilities and other companies, you may well find there is need for special training for which your curricula could be adapted. Or, possibly, cooperative programs could be developed involving on-site work experience and on-campus classroom training to prepare students to enter technical positions in nuclear power plant design, construction, and operation.

As I conclude, I want to emphasize that for the remainder of this century there are only two sources of energy which we can use to replace oil and gas and these are coal and nuclear energy. I believe we will have to greatly expand our use of both coal and nuclear energy in the next few decades in order to meet our needs. Where possible the emphasis should be on nuclear energy because it is less ecologically disturbing and on balance safer than the use of coal. Further, the fossil fuels, including coal, are limited and have vital uses other than burning for energy. They should be conserved for the future as much as possible. Nuclear fuels are useful only for power generation and with the breeder reactor can supply world power needs indefinitely.

Of course, the nation is trying to develop additional sources of energy such as solar power, geothermal power, fusion, etc. None of these sources have reached the point where even their basic suitability for large scale use for central station power generation has been demonstrated and none is apt to supply a major part of our energy needs by the end of the century. Thus, for the next few decades we must look to coal and nuclear energy and to a reduction of energy usage to accommodate the shortage of oil and gas.

With this reality in mind, and in the spirit of President Eisenhower's pledge to develop nuclear power for peaceful purposes over 20 years ago, let us pledge the cooperation of industry and the academic community in the development and utilization of trained manpower to fulfill the nuclear promise.



Educational Facilities Planning

Bruce Walker and Daniel Boone, from the architectural firm of Walker, McGough, Foltz and Lyerla, prefaced their remarks in the "Educational Facilities Planning" workshop by explaining their firm's role in designing technical education facilities and by presenting slides showing many of the buildings the firm has designed.

Most of their work with technical education facilities has been in designing the facilities as part of correctional institutions, explained Mr. Walker, one of the four general partners in the firm. Although the firm has not specialized in any one area, he said, their principle area of emphasis has probably been correctional facilities.

The slide presentation displayed the variety of buildings and projects with which the firm has been involved. Among them were Spokane's Washington Water Power building, the Washington State Pavilion built for Expo '74, the women's correctional facility at Gig Harbor, Washington, a vocational-technical education facility at a high school in Moscow, Idaho, and other hospitals, institutions and buildings.

Walker and Boone divided the remainder of their discussion into two main categories involved in facilities planning: the pre-selection and post-selection phases. "The goal that we feel every architect and client must try to achieve," Walker stated, "is to receive the best value in terms of the building for the dollar spent. That is essentially the overriding goal of what we are all trying to do."

The pre-selection category, he continued, involves the responsibility of the client and his role in contributing to the achievement of this goal. This phase, he explained, is often minimized or even overlooked. Many clients don't want to spend a great deal of time in selecting an architect, and will often rely on obtaining an architect that did a job for "somebody they known."

"Every job," Walker said, deserves a very sincere and careful selection process." Generally, he continued, that involves first of all announcing the job in a public newspaper or publication with a brief, one-paragraph description.

Those who have responded should then be sent a brief questionnaire that delineates their qualifications concerning the specific job requirements, to which they are to respond in writing. A screening committee can then evaluate their answers and screen the respondents for personal presentations. In an hour- or portion of an hour-long presentation, with appropriate criteria, the client has the opportunity to find the most qualified architect.

In this selection process, Walker explained, the client should evaluate carefully each responding architect's qualifications in four main areas: quality, organization, experience and committment.

The first of these, quality, can best be determined, he said, by checking the architect's qualifications with other architects. The profession has regular pattern of competition, Walker explained, in which all projects are evaluated on an annual basis. This is a very effective method by which a client can judge the quality of work accomplished by any individual firm.

A second important area for consideration is organization--the personnel and organizational make-up of the firm. A client must know the people with whom he will be working--can he communicate with them? can he trust them? does the operation run smoothly and efficiently? Evaluating the organization, Walker said, simply involves spending time with the people who will be involved in the project.

The criteria for experience, Walker cautioned, should not always be limited to experience with the particular type of building the client needs. Although evaluating the same type of work previously done by an architect can help in judging his experience, the client should look to other types of buildings as well. "If a firm has done a quality job on a hospital," Walker said, "it certainly follows--to my way of thinking--that they can do a quality job on an educational facility. It may take them a little time to educate themselves, to get oriented, to discover your needs. But doing the quality job on a hospital has identified that firm as knowing the appropriate procedures and dedication to get the proper job done."

The fourth area of concern--equally important in the selection process--is commitment. The firm must be in a position that allows them enough time to take

care of your job properly. "Suppose a firm signs a contract in May to do a million dollar job for you," Walker said, "and then in July receives a $40 million contract from someone else? The firm must be very sincere in their commitment to the first job, or the second job will upset the office and get the project in trouble right away." The firm must be very sincere in their commitment to the first job, or the second job will upset the office and get the project in trouble right away. The firm a client selects he explained, must be prepared to make a firm commitment what ever circumstances might arise.

Boone: The Post-Selection Phase

Dan Boone, a senior associate and project manager for the firm, explained his role in the architectural procedure as more process- than product-oriented. He spoke specifically about some of the processes and methods that are utilized by firms to insure reaching the goal of producing quality product at the lowest possible dollar output.

"Architecture," he stated, "is a problem-solving profession. We are most concerned with finding the proper balance between function and economy." Their firm, he explained, uses a "programmed" approach. In other words, they employ a specialist in design, who does nothing but design. Another member of the team is an equipment specialist, who works only within that speciality. Each employee has a specific area of expertise--and works exclusively in that area.

"This approach," Boone said, "allows each member of the architectural team to grow and mature within his area of specialty. New techniques. products and materials can be carefully researched. Each specialist can remain closely in touch with what is happening in his area."

This type of efficiency, coupled with a close, ongoing association with the client, can help the architect achieve the necessary quality in any building project. "Communication and effective teamwork," he said, "constitute the approach that we feel is most effective. The thing that most architectual firms forget, however, is the fact that the client is the most important member of the team.

"You can see, concluded Boone, "that to be effective, architects must attempt to reach harmony not only between function and economy, but also between the firm's own personnel and the client."

Metrics Conversion and Technical Education

"The United States is an island in a metric world," stated Dr. Virginia White, area leader of math and science at Juanita High School in Kirkland, Washington. Dr. White, speaker in the "Metrics Conversion and Technical Education" workshop, continued: "The world has been gradually going metric, while we've gone our own merry way and kept our traditional system."

As far as actual legislation is concerned, she explained, the U.S. was enabled to use the metric system as early as 1866. In treaties of 1875 and 1900, 37 countries adopted the metric system and established a planning commission in which the United States has been represented. None of the earlier or more recent legislation passed concerning the metric system has been compulsory, she said; and although a recent bill (HR 59) has provided changeover enabling funds to states, current efforts are often overlapping and redundant.

A portion of the $50 million made available by HR 59 was awarded in a three-year grant to the state of Ohio to be monitored through Ohio State University. From these funds, the University will compile an annotated bibliography, write a position paper on the issues and alternatives and develop test metric instructional package for selected occupations. The materials will be formalized and used in the federal government.

The federal government, Dr. White explained, is not at this point concerned about metric conversion in the schools. Schools, she said, in the science and technical departments, have always had good touch with the metric system. The concern is mainly directed at changes in the common measures for trades and industry. "We have some resistance," she stated, "and one of the reasons that came up to defeat the latest legislation on metric was the fact that the trade unions were not for it. They gave many reasons--such as the difficulties of tool changeover and the expense involved."

These problems, she felt, are offset by the many benefits of metric changeover in the U.S. "In addition to the fact that we're the only nation of any size that's not metric," Dr. White stated, "we must consider the balance of payments. What's the predicted loss of exports that are not going metric?" We once had an edge, she explained, on all of the best technology. Our materials and manufactured goods were so desirable that countries would send technical people here to learn and buy. They bought special tools to work on American goods, and with our help have managed to emulate our country's examples and expertise. "Now, in the world of competition for goods," Dr. White stated, "we're not good enough to continue with our old measure and there's no hope at this point for us to change the world to our system of measurement." To compound the problem, she said, the Common Market has said they will not accept any goods for bid beyond 1978 that are not in metric. By that time, the country wanting to do international business will have to convert those items they intend to put on the international market.

"What does this mean?" asked Dr. White. "It means that we have a pretty clear indication that the metric system is inevitably coming to the United States." There are two levels of conversion currently in progress in the country, she explained: soft conversion and hard conversion. Soft conversion involves no change in the actual materials, but all the specifications are written in metric. "I would expect," Dr. White said, " that that's the way we'll manage to trade internationally in 1978, because it's really impossible to change that quickly on the primary manufactural materials. Everything will be described in metric even though the materials remain the same sizes and shapes."

Hard conversion, however, involves changing the actual materials. Several companies are leading the way in hard conversion, she said, and recently the U.S. Department of Defense converted to the metric system. All of their specifications are being written in metric; people who wish to bid on defense contracts will have to comply with the metric changeover.

All of these factors involved in the metric changeover have definite implications for those involved in technical education, Dr. White explained. "We've got a bad job for a few years while the changeover is occurring," she stated, "because we're going to have to serve both masters. There will be some who will upbraid you if you haven't taught the customary system and others who will

upbraid you if you haven't taught the metric system. That means we must continue teaching both methods over a period of time."

The changeover to the metric system won't be difficult for children, she continued, but rather for the adults--people who have lived with the old system. The system itself is certainly no more difficult then our current system. The problem occurs in converting--changing from a system that is familiar to one that seems confusing and unfamiliar.

It was interesting to note, she said, that a recently conducted national survey showed that those who had quick extensive knowledge of metric liked it a great deal. Those who had general knowledge of the system were somewhat neutral; those who had little knowledge of metric didn't like it at all. The amount of acceptance for the changeover was directly related to the knowledge of the metric system.

"To gain a knowledge of metric," Dr. White said, "we need something to reach out and take hold of. I think it will be similar to the change to modern math. For awhile I converted in my head. After awhile, I stopped converting and began thinking directly in the new language." She said that while the math itself didn't change the way in which people talked about it changed; and it took some time for people to make that conversion in their minds.

"As soon as you're familiar with it," she said, "you'll find yourself thinking directly in metric." She also compared it with learning a new language--at first a person must translate, but soon finds himself thinking directly in the new language.

The changeover to metric in the schools, Dr. White said, will require cooperation among all educators, and certainly between the various departments in any one school. "Cooperation," she said, "is the key. The person in charge of the overall change must be someone who can speak effectively to all departments." Math experts can help in putting together the flow of instruction for the science of teaching measurement and the metric units, she said, but the various areas that will use it and apply it will know better how to make realistic applications. One thing that must be watched carefully, she explained, is quality control on the educational opportunities. Teachers must be adequately trained in the metric system before attempting to teach it to students.

"For a time," Dr. White concluded, "we must have dual consideration. Both systems must be taught, and learning packages must be utilized that can adequately speak to both the traditional system and the metric system."

CETA - Implications for Technical Education

In a session designed to familiarize technical educators with the Comprehensive Employment and Training Act of 1973 (CETA), and to demonstrate how technical educators can work with, implement and benefit from the CETA, audience members were given the opportunity to view the Act from three distinctly different viewpoints.

Workshop speakers were Dean McCorkle, Regional Specialist for Implementation of CETA and Supervisor of CETA Programs for the U.S. Department of Labor, Region X, who defined and clarified the legislation, giving its background and methods for implementation; Edward S. Singler, Manpower Coordination Officer for the Department of Health, Education and Welfare in Region X, who spoke of DHEW's role in CETA Planning and Programming; and Roger Mussell, Electronics Technology Coordinator at William Rainey Harper College in Palatine, Illinois, who outlined development, delivery and evaluation for specific CETA proposals.

An Overview

"CETA has been described in many fashions," began McCorkle. "Some say it is a multi-headed monster. Others hail it as the first major change in the delivery of manpower training services in this nation since the early 1930's, and some believe that while the players have changed the game remains the same."

McCorkle went on to explain that he felt a person's perspective of CETA would depend to a great extent on its effect on him and his institution, on whether he came from a very complex area with a population of several million or a relatively simple structure in a small city or county with a population of 100,000 or less.

McCorkle next proceeded to trace the evolutionary processes that have brought the CETA to its current position. In 1970 the Department of Labor established about 12,000 manpower planning staff positions under state and local elected officials. Following this, a redesigning of the Cooperative Area Manpower Planning System (CAMPS) moved to support the decentralization mode of operation and permit increased initiative by state and local officials in the planning and execution of manpower programs. "CAMPS was asked to identify community needs," McCorkle explained, "to gather all of the available data and information on the training needs of people within their jurisdiction, analyze existing programs as they relate to the fulfillment of these needs and finally to submit recommendations for the kinds of programs that would be funded and who the program operators would be." To support this new influence, McCorkle continued, the Manpower Administration established a policy that "federal judgments will not be substituted for those of appropriate state and local officials if their recommendations are clearly represented, carry out objectives of the legislation, and are reasonably suited to local needs and are consisted with existing laws and interagency agreements." This policy remains in effect today.

McCorkle personally has found the decentralization policy effective. "It is my belief," he said, "that there is a strong commitment and much integrity at the local level in dealing with the complex programs presented in the CETA legislation."

Without benefit of legislation, the Admininstration in 1972 moved to implement an administrative form of decentralization and decategorization to the maximum degree possible under existing laws. Meanwhile Congress showed increasing interest and concern in dealing with a new delivery system for Comprehensive Manpower Programs. The Administration then turned its efforts to the development of the CETA program and in consort with Congress produced the Comprehensive Employment and Training Act of 1973. The following briefly outlines the seven titles contained in the Act, as presented by McCorkle:

TITLE I

"Comprehensive Manpower Service" basically deals with the monies previously used for categorical programs under the Manpower Development and Training Act of 1962, and the Economic Opportunity Act of 1964. Broad powers in determining the kinds of program design have been delegated to Prime Sponsors, to whom eighty percent of the monies are allocated directly.

TITLE II

"Public Employment Programs" basically is administered in a similar way as the Section VI Emergency Employment Act of 1972. The purpose of the Title is to provide unemployed and underemployed persons with transitional employment in jobs providing needed public services in areas of substantial unemployment and wherever feasible, related training and manpower services to enable such persons to move into unsubsidized employment or training. Ninety percent of the funds under this Title must be used for wages and employment benefits to enrollees.

TITLE III

"Special Federal Responsibilities" requires that the Secretary shall use funds available under this Title to provide additional manpower services authorized under Titles I and II to segments of the population that are in particular need of such services, i.e,, youth, older workers, persons of limited English speaking ability, etc.; to provde service to Indian tribes and bands through a national program; to provide no less than five percent of these funds for migrant and seasonal Farmworker Manpower Programs; to provide financial assistance for special youth programs (i.e,, Neighborhood Youth Corps), as well as chronically unemployed, special programs leading to career opportunities, special services to middle aged and older women, etc., and requires the secretary to conduct a study of the extent that artificial barriers restrict opportunities for employment and advancement within agencies conducting programs under this Act.

TITLE IV

Established the Job Corps within the Department of Labor as a nationally Administered Program with no basic changes.

TITLE V

Establishes a National Commission for Manpower Policy.

TITLE VI

Signed into law by the President on December 31, 1974, provides for additional public service jobs and training programs for unemployed persons.

In differentiating between Title II and Title VI, McCorkle said: "We could best describe Title II as designed to serve the individuals who have historically been in the unemployed or underemployed ranks because of the lack of certain academic or vocational skills that prohibit them from being competitive in today's job market, whereas Title VI was developed during a period of economical crisis to provide short term employment to large numbers of workers recently terminated from employment and who have exhausted Unemployment Insurance benefits."

TITLE VII

General Provisions providing definitions and other conditions applicable to the Act.

"CETA is not a panacea for all the problems that face us today in trying to develop the productive services and energies of people, "McCorkle said, "but I believe that it is an effort in the right direction to conserve and develop our human resources and to help individuals adjust productively to changing economic conditions."

McCorkle felt it too early to judge the success of the program; however, he did say that if judged on sincerity, intellect and manhours of those dedicated to its implementation, it would be determined successful. "Success or failure of actual results would depend on many things," he said. "Not the least will be the influence of those present today and your associates throughout the academic community."

Because Prime Sponsors across the country are trying to find new innovative methods to solve old problems, implications and opportunities for technical education are quite clear. CETA offers opportunity for a truly comprehensive approach to manpower problems. "We must terminate the fragmented approach that has historically been made by various Federal, State and local agencies," McCorkle stressed, "and resolve the planning and coordination problems that have served to deny services and frustrate those who were the supposed recipients of services. The decision making has now been transferred to the local level where it is believed that local problems, conditions and needs can more appropriately be assessed and more intelligent decisions to resolve these problems can be made. I would hope and expect that you will be a full partner in making these decisions and resolving these problems. I believe such participation is prerequisite to the successful development of CETA."

Singler: DHEW's Role in CETA Planning and Programming

"Whether you are an old hand or relatively new to manpower planning," began Edward Singler, "you probably have come to realize that the DHEW has a significant role in manpower training activities in your community."

In 1974, DHEW programs accounted for between 40 to 50 percent of the total federal outlays for manpower efforts, he continued, pointing out that major DHEW manpower programs include vocational education, vocational rehabilitation, adult basic and remedial education, allied health manpower, paraprofessional training and supportive services.

Prior to CETA, Singler said, the coordination of programmatic efforts between the Department of Labor (DOL) and HEW was somewhat ineffective. HEW, by failing to aggressively support the old CAMPS planning process, contributed to the lack of coordination. Since implementation of the CETA, he explained, HEW has been committed to searching for ways to bring about a truly comprehensive manpower planning process. With passage of the Act in August, 1973, HEW immediately engaged in joint discussions with DOL to delineate HEW's role in CETA. In June, 1974, a Memorandum of Agreement between HEW and DOL was signed, containing sections providing the following:

1. technical assistance to DOL and prime sponsors from HEW;
2. HEW regional offices review of prime sponsor's annual plans;
3. HEW and DOL regional office review of HEW grantee plans.

Following the signing of the Agreement, a manpower coordination unit was created in the office of each HEW Regional Director. "The existence of this unit in each regional office," said Singler, "is an invitation to the manpower training professionals to offer creative ideas on how HEW's existing methods of doing 'manpower' business can be more responsive to your needs and the goals of CETA." The manpower

coordination staff can provide technical assistance and information regarding HEW manpower efforts. In the future, the HEW offices hope to aid in developing service coordination arrangements such as purchase of services, sharing of facilities, joint program planning and program administration, possible outstationing of staff from one program to another, and joint service referral procedures.

HEW's commitment, Singler continued, is in aiding better coordination in program planning and service delivery. "Development of a system to coordinate the activities of all education and training programs and supportive services operating in each local area," he concluded, "is the only effective manner by which scarce resources can be stretched to meet the needs of the total community."

Mussell: Proposal Development, Delivery and Evaluation

Development of a proposal for a CETA-funded manpower training program involves, Mr. Mussell began, three basic areas: (1) interpretation of the local governmental body's request for proposal, (2) identification of a saleable and marketable training idea, and (3) ability of the institution to support the development, delivery and evaluation of the training program.

Direction and orientation by the local government agency indicates the form and style the proposal is to take, Mussell continued. Developing a saleable idea into a marketable program involves responding to items in a regular format that he outlined as follows:

I. Introduction
   A. Background and Organization
      1. History and Location
      2. Purpose
   B. Problem Identification

II. Statement of Need
   A. Proposal
   B. Program Objectives (most important part of proposals)

III. Program (procedures and processes for carrying out program objectives)
   A. What you plan to do
   B. How you plan to do it
      1. Sequence of events
      2. Timetable by major time frames
      3. Who will carry out the program
      4. Where will the program take place

IV. Evaluation
V. Future Directions
VI. Budget
   A. Personnel
   B. Supplies
   C. Equipment
   D. Travel
   E. Maintenance
   F. Consultant Service
   G. Facilities

This format, said Mussell, reflects the time sequence of events which must take place to obtain a proposal document that may be looked upon favorably and also serves as a valuable guide to assure that all key points have been discussed.

"The key implication for technical education", Mussell said, "is professional recognition for teachers and administrators in developing well thought out strategies for conducting short-term training programs and meeting specific local needs."

The delivery mechanism for CETA training programs is dependent upon the type of clients entering the program, the project staff and institutional support, Mussell said. Once specifications for entry into the training program have been developed, client recruitment becomes a major concern. Advertising in several forms as well as referrals from the state employment service, local high schools, industry and community organizations can aid in the recruiting effort, he pointed out.

Closely associated with the recruiting effort is the formal curriculum development to finalize initial project proposal plans. Emphasis is on a performance based structure that reflects sound practices of curriculum development utilizing the most appropriate teaching techniques to reach and teach the clients.

"The implication for technical education," said Mussell, "is fundamental and direct. We are involved in education for work. The education must be explicit, meaningful and include no frills. The product of the program needs the job entry level skill to sustain the family unit of which the client is an important part."

Delivery of the program is enhanced by the availability of institutional supportive services, including accessibility to the learning laboratory for language and math skills development, counseling from the standpoint of career and academic personnel and assistance from the job placement office. These services allow technical training an important backup for referral when special problems arise, Mussell explained, aiding in lowering the drop-out rate and helping to meet an immediate need.

The evaluation component is the most important in CETA program development, said Mussell. He stressed that because it will be a concern of the local government agency, evaluation should be identified in the proposal and incorporated into the ongoing project. For the most part, he said, descriptive statistics are sufficient to evaluate the major thrust of the project--the clients served, the curriculum, and fiscal budgeting and accounting.

"Each program's evaluative component will be somewhat unique," Mussell said. "The form and style will depend on the needs of the local governmental agency for justifying success or failure of a project and the training institution's commitment to the component itself."

Although the implications for technical education in the evaluation component are not unique, they reflect elements by which others judge the work of technical educators, Mussell explained. "Therefore," he continued, "in order to maintain our professional nature, qualify for additional resources and continue our response to local training needs, this phase of each project is important."

In concluding, Mussell stressed the importance of proposal development, delivery and evaluation as a concern for all technical educators. "We live and work in an environment where justification, cost benefit and program worth represent major elements of success or failure," he said. "We as technical educators must continue to put the 'best' efforts into that special education which is of concern to us."

Training Minorities In Technical Education

"In order for us as educators to effectively train minority students in technical education, we must first try to understand who it is we are trying to educate," began Wendell Harrell, first of three speakers in the "Training Minorities in Technical Education" workshop. Harrell, Associate Dean for Occupational Education at Seattle Central Community College, continued with a vivid description of the background of many minority students. Most, he said, are probably the children of poor, working class parents who are themselves undereducated; most are products of an education system that has failed to articulate with minorities to the extent that their educational achievement level is far below the national average; most have been systematically excluded from the mainstream of American economic life, thereby being unemployed or underemployed.

Most minority students, Harrell continued, will quite probably view vocational-technical education as a "white man's play" to keep him at a lower economic strata. Many minorities, especially blacks, according to Harrell, may totally reject what they view as the middle class establishment, with the emphasis on wealth and affluence attainment they they term "white nationalism," embracing a new set of values that they call "black nationalism."

"In a sense," Harrell continued, "the total rejection of the establishment is based on the fact that the promises to the blacks have produced tangible results only for the top 10 percent of American Negroes. For the other 90 percent of blacks, the ghetto still remains a closed society, dark and dreary with little hope to advance."

Harrell referred to a survey of businesses conducted by the Small Business Administration a few years ago. The survey indicated that blacks held 8.4 percent of personal service jobs; 1.4 percent of other service jobs; 2.6 percent of construction jobs; 1.2 percent of manufacturing jobs; 1.9 percent of retail trade jobs; and 1.4 percent of other industry jobs. "It is significant to point out," said Harrell, "that though blacks constitute 11 percent of the total population, their share of the total business is less than three percent."

"These industry percentages," Harrell continued, "coupled with high unemployment--twice the national average--low incomes, underemployment, low educational achievement, in addition to a high business failure rate among blacks, enable one to gain a perspective from which to understand the tremendous challenge facing technical educators today."

In view of these circumstances, Harrell sees the need for changes throughout the educational system, in effect providing for minorities education that allows a real opportunity for complete participation, acceptance and fulfillment. It is also important, he said, that education provides the means for obtaining a basic income that is commensurate with the needs of our capitalistic society.

The system must stimulate a feeling for the value of excellence, while providing the individual with a sense of pride in himself and his heritage, Harrell stressed. It must also strive to provide the basis for an elimination of the feelings of inferiority that currently exist. In order for education to provide these basic needs, Harrell emphasized, educators must become sensitized to the various feelings and failings that exist in the black and other minority communities. An education system designed to attract, hold, motivate, and prepare the minority youth for creative involvement and upward mobility in the world of work, must be encouraged by new plans for implementation.

According to Harrell, these include:

--accelerated recruitment of minority students;

--improved intake counseling and testing procedures that do not threaten minority students;

--after ascertaining the student's basic skill level, adequate services to enhance these skills, providing better chance for success;

--adequate tutorial and support services;

--review and revision of one- and two-year occupational programs, allowing skill levels to determine time frame, so young people do not feel 'locked in;'

--new means of financial aid to minority students in educational pursuits;

--expanded federal aid programs for hard core unemployed;

--continued and expanded curriculum development in new career fields now open to minorities;

--improved teacher techniques to assure that learning styles of students are taken into consideration;

--upgraded in-service teacher education to sensitize teachers to the needs and plight of minority students.

Garza Encounters "Academic Syndrome"

Pedro Garza continued the presentation, sharing insight gained from his experiences as Minority Affairs Apprenticeship and Training Coordinator for the Department of Labor and Industries Apprenticeship Division for the State of Washington.

Garza stated that he often encounters minority students who have graduated with liberal arts degress from 4-year institutions, who have decided after graduation that they want instead to become technicians. These young people, Garza feels, are facing the "academic syndrome" that often faces minority and non-minority students alike. In taking a close look at the minority situation today, Garza stated: "Sadly enough, but not surprising, minorities today, to a large extent, are no better informed about the tremendous opportunities that exist in today's fast-changing technological society than they were 15 or 16 years ago."

Minority parents, Garza observed, also get that bug known as "academia." While he agrees that we need doctors, lawyers, teachers, and many other professionally skilled workers, Garza stated that certainly all segments of the educational community must make a stronger effort to "awaken the awareness of those who may find with technical training a rewarding and satisfying career."

Speaking with knowledge of his own Chicano background, Garza pointed to the Chicano community as an example of the dire need of all minority communities for skills in the technical occupations that serve their segment of the population. "It is the responsibility of our training institutions who have or can develop the capability to meet the needs of minorities in the area of technical education." He pointed to the health field as just one of many areas needing skilled minority workers, often bilingual, to meet the needs in many minority communities.

In preparation for the workshop, Garza undertook a survey of the approved technical skills apprenticeship program at the Westinghouse Corporation located at the Atomic Energy Commission, Hanford Works. His purpose was in learning who was in the program, how he/she got into the program, and what skills and training each person possessed prior to entering the program. His survey indicated the following: white applicants selected for training had an average of 2,000 hours of previous technical training at a technical training institution, community college or service school. Westinghouse Corporation's affirmative action program has been extremely effective. There are now three females and eleven minorities in the apprenticeship program. All have come into the regular program by way of a pre-apprenticeship program developed by both labor and management at Westinghouse. "This highly effective program underscores the need for positive outreach and recruitment of minorities for training in the technical occupations," Garza stated.

In concluding his presentation, Garza pointed out the awareness among technical educators of the many problems that must be faced noting that this is one of the first steps in solving those problems. "There is no remedy to cure all ills," he said, "but those of us who can contribute towards curing one sickness can and must attempt to cure the social and economic sickness caused by lack of participation in the mainstream of technical training and opportunities for minorities."

Dupree Highlights Opportunities For Minorities

Cal Dupree, the workshop's final speaker, is Program Assistant for Native American Education and Community Affairs for the Washington State Board for Community College Education. Dupree reiterated the fact that educators locally and nationally are looking for ways to get more minorities into programs. "Never before has there been so much opportunity to begin to identify, recruit, counsel, teach and/or tutor, train and employ such a vast amount of untapped manpower," he observed.

State and federal agencies are making a start, Dupree pointed out, since several minorities have now been appointed to national and state advisory policy boards. The minorities on these boards are now having the opportunity to make decisions, approve rules and regulations for federal and state agencies on vocational education and on education in general.

As an example, Dupree referred to the National Advisory Council on Bilingual Education, which is now beginning to have a definite effect at the state and local levels. Having started as an Advisory Committee only, the Council is now setting policy and approving rules and regulations for all bilingual programs in the Department of Health, Education and Welfare.

Dupree mentioned the adoption of new rules and regulations for Part J of the Vocational Education Act, approved March 4, 1975, as another point of impact for many minorities. The Act approved funding for $2.8 million for Bilingual Vocational Training. "As interpreted by HEW," said Dupree, "Bilingual Vocational Training means 'training or retraining which is conducted as part of a program designed to prepare an individual of limited English speaking ability for gainful employment or semi-skilled or skilled workers or technicians or subprofessionals in recognized occupations and in new and emerging occupations.'"

Although this funding will be helpful in making a start toward better technical education training opportunities for minorities, Dupree said that unfortunately, many do not even know that the law exists. (Deadline for application was April 11, 1975.)

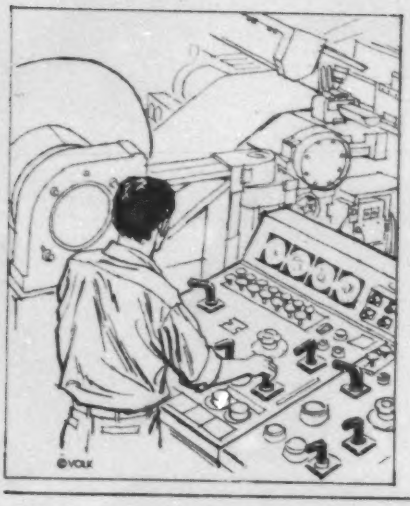
Dupree pointed out other agencies that are becoming increasingly sympathetic to minority needs, among them the National Advisory Council on Vocational Education. He explained that the

Council now includes many people of minorities who are completely involved in setting policy that greatly effects the training of minorities.

All of these advances can help, Dupree felt, although there is still a long way to go in improving technical education for minorities. In concluding, Dupree stated, "We want and need, desparately, the best technical training possible, so that we can return to our minority communities to teach and help them to develop skills that they can use to develop their resources, both natural and human resources. They're out there--all we have to do is take the bull by the horns."

Discussion following the presentations focused primarily on the problem of motivating minority students, especially when they are faced with the prospect of taking preparatory, entry-level courses to prepare for regular programs. Garza stated that the problem of motivation often stems from the environment in which minority students exist. Often too, he pointed out, it's the "whole system" only.

Some present pointed out that perhaps motivation could be improved if students were given a taste of occupational training in conjunction with those catch-up courses. Harrell stated that with most community colleges, that plan is in the theoretical stages only, and is prevented from advancing by lack of resources and manpower. "Also," he said, "we have to get our instructors to feel that four walls and a blackboard is not the only way to teach--and we have to get them involved in some innovative ways of attacking some of these problems. We have a big selling job."



Industry Based Career Education

The pressing need for the nation's educational institutions to furnish industry-based career education programs to fit the needs of industry was the impetus behind the workshop presentation for "Industry-Based Career Education."

The workshop presentation underlined the shift in industrial education needs in the technical field and pointed up the lack of response to those needs by most educational institutions.

Hoerner Indicates Misguided Direction

In his presentation, Dr. James L. Hoerner, assistant professor and coordinator of occupational technical programs at Virginia Polytechnic Institute and State University, referred to statistics published early in 1975 by the U. S. Chamber of Commerce. The statistics pertained to the target populations for industry-based career education on the community college level and were used by Dr. Hoerner to show the misguided direction that educational institutes are still taking.

The Chamber of Commerce report shows that only 20 per cent of the jobs in today's labor market require a four-year degree; yet 76 per cent of the secondary students are enrolled in college preparatory or general curriculum programs.

Further, the Chamber of Commerce reported that only 23 per cent of today's high school students will graduate from a four-year college.

"With a few quick calculations," Hoerner said, "it is reasonable to say that about 53 per cent of today's high school students are graduating without occupational education of any type and will not be going to a four-year college."

Those with no occupational training, when added to the 24 per cent of today's youth enrolled in vocational-technical training in secondary schools and who need more training before employment, increase the population seeking services of the community colleges in industry-based education to 77 per cent of today's secondary school enrollment.

Hoerner also said that another target population comprises adults who are either underemployed or unemployed because of obsolescence or a desire to change occupations.

The community college programs, according to Hoerner, have not been modified to serve this large population and its educational needs.

"Too many of our community colleges shun an industry-based educational effort," Hoerner said. Through their isolationistic techniques, he said, the colleges fail in servicing the prime need of industry, which is to provide a properly skilled, technically trained employee.

Hoerner summarized his reasons for energetic pursuit of a viable industry-based career education program by listing six advantages:

+ It has a greater amount of relevancy.

+ It removes time lag between learning and earning.

+ Training takes place on the latest equipment in industry.

+ No expensive equipment or facilities need be purchased by the college.

+ Skill techniques are the same as those used and conditions are the same as those experienced in industry.

+ It facilitates transition into full-time employment.

Piercey Emphasizes "Intensity" as Solution

Jim Piercey, dean of technical education, Lane Community College, Eugene, Oregon, supported Hoerner in his presentation and offered a solution.

"Industry is best skilled at developing and producing a manufactured product," Piercey said. "We in technical education are best suited for developing and producing the perfect employee," he continued, "but some of us are failing badly in getting the job done."

Piercey's theme was a simple

statement: "Training does not create jobs; training creates salable employes." The job of the community college is to produce those salable employes, and to do so will require considerable change in methodology, according to Piercey.

Piercey's solution is intensity. "If we don't go out after industry, they are not likely to come to us," he said. "We're not kidding industry; we might only be kidding ourselves. Intensity by the educators can get the job done."

The colleges should use industry, Piercey believes. They should be organizers and allow industry to use their expertise in helping to provide an industry-based, technical education system.

"Use cluster training. Use individualized instruction, video tapes, video cassettes, audio cassettes and learning packets.

"Take the means to industry," Piercey said. "Integrate your basic education with your skill training. Give credit by examination. Give credit for past experiences. We've got the delivery systems. Be a manager--use them."

Hill Points To Advisory Committees Effectiveness

Barry Hill, chairman of the Business Department of Spokane Community College, concurred in the aims outlined by the other speakers. He also pointed out that Spokane Community College has made substantial progress in the industry-based career education field.

One especially successful measure employed by the college, Hill said, is the use of advisory committees for developing curricula content. The advisory committees are composed equally of representatives from the college and from industry. The college is thus able to base educational material and methodology on what industry wants and needs. This trend is continued by including one or two quarters of industrial internship in most industry-oriented courses, Hill said.

Developing Manpower for Nuclear Technology

Men and women with the special qualities of intelligence and quick reflexes are needed in the field of nuclear manpower, according to Gordon J. Rogers, manager of Engineer Administration Engineering Department of the Hanford Engineering Development Laboratory, who opened discussion in the workshop entitled "Developing Manpower for Nuclear Technology."

Training Operators for the Fast Flux Test Facility

The HEDL facility is managing the design and construction of a new Fast Flux Test Facility (FFTF), an experimental nuclear reactor used for test and development of nuclear performance data. The HEDL facility does not actually generate power, Rogers said.

Since Hanford is a research facility, the "man at the throttle" must be knowledgeable, proficient and able to analyze problems and react to them instantly, Rogers said. The FFTF must be operated in accordance with Energy Research and Development Administration (ERDA) guidelines.

Safety and proficiency requirements dictate that only the highest quality manpower resources be utilized for the HEDL. Nuclear Regulatory Commission (NRC) licensing requirements must be met, Rogers said.

According to Rogers, personnel are to be trained for three different job categories: Operations engineers, reactor technicians and operations technicians.

Within reactor plant operations the operations engineer may be assigned to any reactor operating position, including the chief operator's station. Shift supervisors must be qualified as operations engineers. The fuel-handling operations may require supervisory duty.

Operations engineers must have a minimum of two years of college or equivalent and four years of nuclear plant experience. Extensive training is required for operations engineers of the FFTF. The initial training program will comprise 85 trainees in three classes.

According to Rogers, the initial class will have 25 students who possess a four-year college degree. These students will become the nucleus of the operating crew during construction and testing phases of the FFTF.

The second class of 30 trainees will start in July 1976. These personnel should have two years of college or equivalent reactor operations experience, Rogers said. Graduates of this course will become reactor technicians, but the high performers may qualify as operations engineers after the FFTF is completed.

Reactor technicians will function at any of the reactor operating stations including those in the central room, but excluding the chief operator's station. Fuel-handling operations are within the reactor technicians responsibility. Two years of college or equivalent nuclear plant experience is required.

The third class of 30 students should be personnel with two years of college or equivalent reactor operations experience. Most of these trainees should qualify initially as operations technicians.

Rogers said that operations technicians may be assigned to reactor plant operations or fuel-handling operations. They must have a high school diploma or its equivalent and a minimum of two years' work experience. Because of their limited duties, NCR licensing requirements do not apply to them.

Graduates of the first class will become the cadre for the FFTF. They will be involved with actual "hands-on" training following remote-site training. The instructors, who will be from the HEDL, are fully qualified working professionals.

The trainees will be given a comprehensive writtem examination and a final oral examination upon completion of qualification training. Graduates will be considered fully qualified to operate the FFTF.

Training will not be left to one-time qualification, however, Rogers said. Each person working on the FFTF must requalify annually on emergency and abnormal plant conditions. They will receive biennial requalification on all remaining subjects.

It is apparent that the expend-

iture of time and funds to train personnel for the FFTF will be substantial, and according to Rogers, the expenditure must be carefully administered. However, the relative increase in effectiveness and production of the facility will justify the expense, he said.

One of the most significant problems encountered by personnel of the HEDL and most other technical facilities is the preparation of effective, detailed written procedures, Rogers said. He added that improved skills in oral and written communications are goals not always achieved.

"Writing courses are conducted to improve the skills of assigned personnel," Rogers said. "Outside help is often called upon to assist our technical personnel in the improvement of their basic writing skills. But the problem of development of competent, effective technical writing ability is increasing geometrically. It remains unsolved. We are soliciting the assistance of anyone who can offer tangible benefits in this area."

Daniel Hull, Programs Manager for Technical Education Research Centers/Southwest in Waco, Texas, prefaced his presentation by emphasizing the sharp rise in demand for nuclear technology manpower in recent years due to national efforts to develop nuclear generated, electrical power efficiently and abundantly.

Until now, he explained, the supply of trained nuclear technicians has come from three sources: (1) Nuclear Navy, (2) AEC (now ERDA) owned, Contractor Operated Laboratories, and (3) Retrained electrical utility employees by equipment vendors and private consultant companies.

"The first two of these manpower sources," stated Hull, "are able to retain higher percentages of their personnel than they had in the past; resulting in a dwindling supply of trained technicians for industry. The third source will continue for some time but is very expensive, costing in excess of $100,000 per student." He added that fewer numbers of electrical utility employees in conventional power plants will be available for retraining as this limited source eventually becomes depleted.

"To meet present and future manpower needs in this field," Hull continued, "two year, post-secondary technical education programs must be developed and implemented to prepare individuals for entry level employment in highly specialized job categories."

To operate nuclear power plants efficiently, safely and economically, Hull explained, requires technicians trained in reactor operation, quality assurance/quality control, radiation instrumentation and radiation protection. Nuclear fuel production, reprocessing, and disposal require technicians with a speciality in radiation chemistry and safety.

Skilled technicians are also needed for other applications of nuclear technology. For example, most major hospitals throughout the nation have nuclear medicine laboratories where radiopharmaceuticals and radiation are used in the study, diagnosis and treatment of specific diseases. Radionuclides have also been extensively employed in plant physiology to create better and more productive food crops and in animal husbandry to improve the care and feeding of livestock. Still another useful property of radionuclides is their ability to render photographic emulsions developable.

Moreover, Hull continued, radioactive materials are widely utilized in industry to measure and control manufacturing processes, to inspect materials and to facilitate research.

Existing Educational Programs

The Technical Education Research Centers and the Southern Interstate Nuclear Board jointly conducted a study in 1972-73 to determine manpower requirements, training needs and existing educational programs for nuclear technicians. "The results of this research," Hull stated, "indicated that in order to realize on a national basis the full requirements of the nuclear field for well-prepared technicians and specialists, the training and retraining of nuclear personnel must be standardized, coordinated and greatly expanded."

Although entry level technical positions were filled earlier by personnel from the U.S. Navy Nuclear Division, he reiterated, this source of trained technicians is no longer adequate to meet industry's needs. In the past, civilian educational institutions have offered programs in the nuclear field mainly at the baccalaureate and graduate levels. In contrast, technicians and operators have been trained primarily by reactor vendors, utility companies and training consultants at extremely high costs. Although the basic theory is more easily taught in junior or community colleges and vocational-technical schools, these institutions have been limited by inadequate information on manpower demand, occupational tasks and program planning.

Although there are institutions in the United States that offer technical education in nuclear technology, Hull explained, most of these have programs oriented toward radiation protection. The few programs that have been offered in nuclear electronics and nuclear engineering technology have demonstrated a high degree of variability in content, duration and orientation.

Current retraining programs to instruct fossil-fuel power plant operators in nuclear technology have also suffered from lack of standardization and coordination, Hull said. A basic difficulty with many of the programs is the limited number of simulators or operational nuclear power reactors in which to gain "hands-on" skills. This is a crucial limitation, Hull explained, in view of the AEC requirement that personnel who operate reactors have a Reactor Operator License. The license is issued only after the applicant successfully completes both an oral and written exam which tests his knowledge of control room instrument indications, reactor and plant controls and radiation safety and control.

"Unlike most other licenses in the power industry," Hull stated, "reactor operator and senior operator licenses are issued for a specific facility rather than a class of facilities." The trainee must master not only the construction and operation of one of the three major kinds of nuclear power plants, he explained, but also the idiosyncracies of an individual plant. "Thus, he said,

"examinations are administered only when the need for a specific license exists, requiring students in training or retraining programs be given hands-on experience with a simulator, or on-the-job training at the particular facility for which licensing will be sought." To provide this type of training, he said, educational institutions, reactor vendors, utility companies and training consultants must coordinate their efforts.

The same variability in training programs evident in the nuclear field is found in other subfields of nuclear technology excepting medicine. As a result, there also is a need for more standardization and collaboration if the quality of technician training is to be improved. In the case of medical applications of nuclear technology, some standardization and information exchange has been achieved due to the coordinating efforts of the AMA Council on Medical Education. Technical Education Research Centers/Northeast also provides a curriculum guide for educational institutions collaborating with hospitals in planning nuclear medicine technology programs.

A National Plan for Nuclear Technician Training

In July, 1974 the Office of Education funded the Technical Education Research Centers (TERC) to develop curricula and instructional materials for two year, post-secondary training of nuclear technicians, Hull explained. Based on earlier work by TERC and the Southern Interstate Nuclear Board a model was conceived for two year educational programs in nuclear technology.

"To assure that the curricula are relevant to job requirements, that the instructional materials are technically accurate, and that graduates of the suggested programs are employable," Hull stated, "advice and guidance have been sought through the establishment of a National Steering Committee for Nuclear Technician Training." The committee members, he explained, were selected by TERC and broadly represent the nuclear field throughout the nation.

At the first meeting in October, 1974 the committee reviewed the program plan, job and task descriptions and tentative curricula. Based on their subsequent recommendations, revisions were made, courses were identified and instructional materials developed.

From the model curricula, twenty-nine courses have been identified which are not normally available in other programs at two year, post-secondary technical schools, Hull said. The courses have been grouped according to subject content into three Nuclear Technology Series: Energy Series, Radiation Series and Quality Assurance/Quality Control Series.

The approach toward development of instructional materials is to create modular learning units based upon specific tasks that the technician must learn on the job. "The trend in instructional materials toward this type of modular design is attributed in part," Hull stated, "to the following desirable features:

--They are performance based.
--They provide flexibility in instructional methods.
--They can be used for individualized learning.
--They can be grouped together into different courses for adaptation to the needs of a local school, institution or industry.
--They provide multiple entry/exit levels for students.
--They are easily updated."

The validity of instructional materials should be verified according to job relevance, technical accuracy and educational effectiveness, Hull said. Job relevance and technical accuracy are evaluated by the National Steering Committee, and the educational effectiveness is determined by schools who are using the materials in pilot programs. The two schools using and evaluating the instructional materials at the time of the Clinic were Texas State Technical Institute in Waco, Texas, and Midlands Technical Education Center in Columbia, South Carolina.

"The materials," explained Hull, "are evaluated for effectiveness according to pretest and posttest data obtained from students who are enrolled in courses as a pilot institution. The 'Procedures' portion of the modules is also checked in the labs of the pilot institutions to determine deficiencies in details, the degree of difficulty and the average duration of time required for completion."

The most valuable information to be obtained for improving the modules, he continued, are the critiques from faculty and students. Faculty members who have taught courses from the modules can objectively evaluate the modules' effectiveness in their particular learning environment; whereas critiques from students will point to paragraphs or statements where the reading level is too difficult or a concept or procedure is not adequately explained.

Hull concluded by saying that by May, 1975, a National Plan for Nuclear Technician Training was expected to have been developed, critiqued and revised. At that time, the components of the plan (job descriptions, task lists, curricula and course descriptions) would be available to interested schools, institutions, government agencies, utilities and industry. At the same time, drafts of all six instructional modules for the introductory courses in Radiation Physics would be available to individuals.

Dr. Robert Brown, Chairman of the Nuclear Technology Program at Texas State Technical Institute in Waco, Texas, focused his portion of the workshop discussion on a slide presentation comparing a conventional power plant with a nuclear power plant and illustrating many of the technical job categories developing from the continuing growth in nuclear technology.

Because of the nature of his presentation, most of the information given by Dr. Brown could not be adequately recorded. He did, however, discuss and display the work of radiation-detection technicians, nuclear instrumentation technicians, radiation chemistry technicians, reactor-operators, quality assurance technicians, nondestructive-testing (NDT) technicians and well-logging technicians. He concluded by saying that nuclear technicians are now being employed in utility companies, architectural engineering firms, construction and manufacturing firms, field processing firms and research facilities.

Faculty Development in Technical Education

Most educators believe that the school system exists as the bridge to increased knowledge . . . that it is the vehicle which helps students bridge the problems in the learning process."

With this statement, Dr. Roland L. Roy opened discussion at the "Faculty Development in Technical Education" clinic workshop. Dr. Roy, associate professor of teacher education in vocational-technical education at Central Washington State College in Ellensburg, Washington, added that if technical educators accept this premise, it is their duty to be "well prepared to offer experiences that will motivate a student to learn, to gain dignity and to be able to compete successfully and live amicably with his fellowman."

This cannot be accomplished, he said, unless technical instructors have additional expertise that goes beyond a narrowed scope of skill knowledge. "An educator must be up-to-date to do his job, because students come from such varied backgrounds," he stated. "With all of the social and industrial change, we cannot ignore the implementation of career education that is now sweeping the country. We must prepare teachers and related personnel to develop individual frames of reference that will concur with the value issues of society and industry."

It is a predetermined analogy in our present world, according to Dr. Roy, that a means for marrying technology, humanistic philosophy and the related academics must be implemented. Because of this need, he said, ". . . the existing barriers or walls that exist between academic and skill proficiency must be eliminated to allow a total education concept to exist."

Dr. Roy, whose experiences have been in industry, the public school system, post-secondary and four-year institutions, believes that the duty for the final preparation of school personnel is the task of the university or four-year college in cooperation with other existing systems.

"It should be a cooperative endeavor between state departments, the university system in articulation with community and junior colleges and in cooperation with public schools and the total community. Plans should be developed that organize the academic disciplines with the necessary manipulative skills.

"It isn't necessary for us to reinvent the wheel," Dr. Roy said, "but we certainly do need new applications for the wheel." Technical education, he explained, must "retool" for present day needs, and this can best be accomplished through honesty among colleagues and openness both at the administrative and teaching levels. "This," he said, "will induce leadership and positive productivity."

Current teacher requirements can often serve as a disadvantage, he continued, because they often encourage hiring of technical and vocational educators who do not possess the necessary tools for the teaching trade. They may have the industrial proficiencies or skills of their trade areas or occupations, but little experience in or knowledge of academic theory. Many, he added, may fill a degree requirement, but not necessarily in their area of trade expertise. The academic skills associated with the degree may carry no related background to the trade education needed. This results in educators who may often be too specialized, or conversely, over-generalized.

Curriculum objectives for teachers preparation should differ from those that prepare individuals for roles in business or industry, he felt, but this trend is found lacking in many of the four-year institutions teaching vocational-technical courses.

Those involved in technical education, he said, often compound the problem by setting a higher priority on technical skills than on academic necessities. "Instead," he stressed, "there should be an appropriate percentage or balance of both."

In order to meet the total needs of students today, Dr. Roy said, technical education teachers should have good knowledge of the related or supporting studies to their occupational skills or proficiencies; they need a cooperative plan with student personnel staffs in the planning for career and personnel guidance; they need to know methods and provisions for teacher certification and self- or professional-improvement; and they need to know methods of self-study and how it fits into the organizational

structure. In addition, he said, a teacher must be familiar with at least the fundamentals or functions of the following:

Administration
Organization
Philosophy
Sociology
Anthropology
Supervision
Psychology
Legislation
Financing and Budgeting
Use of Surveys and Advisory Committees
Methods of analysis, course organization and preparation
Lesson planning and evaluation
Program and curriculum design

The development of qualified personnel can come only through planning, evaluating and re-designing, Dr. Roy said. "We must all be held accountable for our successes and failures," he stressed. "Education is a continuum and cannot be designed for a single lifetime style."

"We need to design a realistic program of faculty preparation and a systematic plan for inservice and continuing education," he stated. "The outdated courses of certification still being used by many states leave a lot to be desired in maintaining quality personnel."

As a result, he said, too many technical educators today do not have the well-rounded backgrounds necessary for the total development of students attending programs of technical or vocational education. Administrators and faculty members together must work to develop programs that will provide all the necessary tools for the teaching trade. This team effort, he said, can help insure proper balance and remove past inadequacies in technical education faculty development. The technical or vocational instructor of the "new breed" must be one who is not only an expert in his skill area but also has a well-rounded, thorough academic and educational background.

"If we persist in saying that trade experience is the major--and sometimes only--prerequiste for teaching in technical or vocational areas, then we are only fooling ourselves," Dr. Roy stated. "Worst of all, we are depriving our students by furnishing them with sub-quality instruction."

Dr. Roy stressed that new programs must be designed to enable faculty members to obtain undergraduate residency credits while off the university campus. Undergraduate programs, the first two years of which can be offered at the community college level in cooperation with four-year institutions, must be specifically developed to meet the academic requirements of technical and vocational instructors. In addition, plans for release time should be divided to allow faculty to gain additional studies in academic and trade skills.

"To accomplish our goals," he said, "the forces within our educational system must lay aside their political animosities and philosophical differences--and communicate with understanding." According to Dr. Roy, with teamwork, a "positive blueprint" for pre-service and in-service education for faculty development in technical education is possible.

"Some good programs already exist," Dr. Roy concluded, "but as teacher education and total staff development are paramount to our needs, we should not sit on existing 'laurels,' but move on to total cooperative commitments."

Vocational-Technical Teacher Education at the Two-Year College Level

The workshop's second speaker, Dr. John Glenn of the State Technical Intitute at Memphis in Tennessee, re-emphasized the growing need for faculty development in technical education. He explained that in the early '70's, in their annual assessment of educational manpower needs and enrollment projections of the state boards of vocational education, the U.S. Office of Education recognized and identified a need for 345,000 vocational-technical teachers at secondary, post-secondary and adult levels between 1970 and 1975. "This," said Dr. Glenn, "meant an estimated deficit of 5,000 vocational-technical educators in the U.S."

The need increased, Glenn added, when the career education concept began to gain popularity in 1971. Federal and state legislation brought the concept to the local level when in 1973, CETA replaced MDTA legislation of 1962 as well as Parts A, B, and E of Title I of the Economic Opportunity Act of 1964. "CETA brought about flexibility and decentralization, creating an opportunity for programs to be conducted by community-based organizations." Dr. Glenn stated, "and thereby opened a whole new area of vocational-technical teacher needs." Federal and state priorities since the implementation of the CETA have increased the need for additional and better qualified vocational-technical teachers, he added.

Recognizing these growing needs, the State Department in Tennessee encouraged the development of a two-year vocational-technical teacher education program to meet teacher preparation needs throughout the state. They knew that to be successful, the program must 1) be within commuting distance for interested persons; 2) fill current and future needs of pre-service vocational-technical education teaching requirements; and 3) be articulated with colleges but brought off the campus and made available in the field.

Those who envisioned the program saw it as a means for improving the quality of teacher preparation in vocational-technical education as well as for helping increase the numbers of prepared instructors available to meet the state's needs. "The goal in implementing the two-year associate degree in vocational-technical teacher education at post-secondary institutions throughout the state," Glenn said, "was to give an individual increased accessibility to professional improvement and encourage him to work toward receiving academic certification for the time, energy and effort that he has invested in his profession."

"The program," he continued, "was implemented two years ago in Memphis and the western Tennessee area." The overall program contains three components that have been developed to cover the total spectrum of vocational-technical teacher training needs at Associate degree level:

1) The specialization component provides four methods for obtaining a required 24 credits in the desired skill area, including methods allowing credit for past skill-training and experiences.
2) The education component consists of in-service and pre-service professional vocational-technical education courses for meeting minimum state certification requirements. Courses are coordinated and articulated with the state's

four-year colleges and universities, and additional studies, beyond the minimum certification requirements, are available for those who desire them.

3) The related course component enables individuals to select courses depending on their desired areas of specialization and allows for maximum individualization within the program.

Based on its acceptance during the past two years, Glenn continued, it is anticipated that the program will (1) give individuals currently teaching accessibility to vocational-technical teacher courses; (2) provide a goal of attaining the associate degree; (3) provide the necessary vocational-technical teacher preparation courses for minimum state vocational-technical certification and re-certification; (4) provide a means for allowing educators in the field to stay current on educational techniques and methods; and (5) increase the supply of qualified vocational-technical teachers to assist the public and private manpower and education sectors in meeting the challenges confronting them as a result of national priority emphasis and federal and state manpower and educational legislation.

"In summary," Glenn concluded, "the two-year associate degree program is just one alternative method for providing additional vocational-technical teachers to meet local needs in our schools and manpower training facilities.

Faculty Development at the Graduate Level

Dr. Alberta Hill, professor in the department of education and the Dean of the College of Home Economics at Washington State University in Pullman, Washington, concentrated her remarks on faculty development at four-year institutions, particularly at the graduate level.

Before faculty development programs at the graduate level can effectively be established, she said, educators and administrators must work together to determine the priorities for faculty development.

Referring to her own experiences, Dr. Hill said that she has discerned five major areas in which she feels priorities must be set. "Faculty development," she explained, "must concern itself with (1) identifying faculty needs early in the development of a program, especially in areas of new technology; (2) preparing faculty members at all levels to work as teams, both within a program and in related areas; (3) preparing faculty to work with individuals of all types, many of whom will be unmotivated; (4) developing faculty members who really understand how people learn and who know the differences in learning patterns of different kinds of people (minorities, disadvantaged, rural, urban, etc.); (5) developing faculties who can teach efficiently, with knowledge of evaluation to allow constant improvement of methods, techniques and curriculum materials.

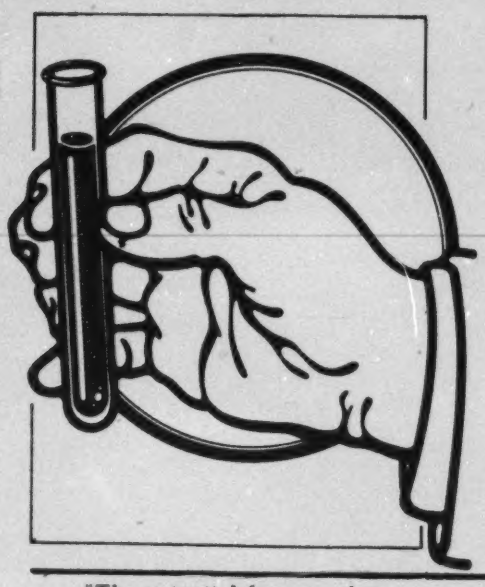
In her participation in the development of a graduate level program to prepare vocational education curriculum specialists, Dr. Hill said, she has found that certian assumptions can and should be made when working with vocational-technical faculty development.

"Perhaps most important," Dr. Hill explained, "is the assumption that all educators and vocational-technical education leaders have some responsibility for curriculum." Since this responsibility will vary with the individual's role (i.e., instructor, aide, coordinator, director, etc.), it is important that skills identified in task analysis in the same way as skills needed in occupational areas in which we're teaching are identified. Because curriculum cannot be constructed on a "cookbook basis," faculty members do need theoretical background, Dr. Hill explained.

The need for teamwork in development of curriculum illustrates the need for the teamwork concept in faculty development programs, Dr. Hill said. "Vocational and technical educators must learn to work effectively with people in business and industry as well as in science and research in the development of programs."

Although this type of faculty development requires realistic and real experiences, and should therefore be a field oriented program it should not be divorced from the University," Dr. Hill stressed. "There are many advantages to coordination with universities, with resources and research facilities in a number of disciplines."

In summary, Dr. Hill reiterated the need for coordinated efforts between educators and administrators in all the various segments of the educational community, emphasizing the need for concentrating on future needs and future goals. "Like so many of the technical occupations you're concerned with at this conference," she concluded, "we cannot rely completely on making an analysis of what is being done . . . because we must project ourselves into the future and see what should be done."



Growth Areas in Medical Services

"The potential for growth in health services is great not only in basic preparatory (pre-employment) programs but also in the area of continuing education for the updating of knowledge and skills," stated Viola Levitt as the opening speaker in the workshop focusing on "Growth Areas in Medical Services." Levitt is director of Health Occupations at Prince George's Community College in Largo, Maryland.

Other speakers in the workshop were Ouida Norris, Chairperson of the Department of Biomedical Engineering Technology at Monroe Community College in Rochester, New York, and Dr. Kenneth Gudgel, Director of Family Medicine Spokane in Spokane, Washington.

Establishing Basic Premises

Ms. Levitt opened the workshop in a discussion of the basic premises that must be established in order to assess the current and potential areas of growth in medical service. She set forth those premises as follows:

1) growth is dependent on need and available resources,
2) need may be defined as lack of something requisite, desirable or useful, and
3) need for growth areas in medical service can be determined by data about supply and demand among other factors.

Ms. Levitt further explained that to determine demand for graduates one must look at job opportunities, growth of services or facilities planned and/or approved, and turnover rates of health personnel in the job category being studied. "Supply on the other hand," she added, "can be determined by data about total number of graduates, where graduates are placed, and mobility of workers in and out of the region.

"The difference between these two factors," she said, "will reveal if a need exists for growth." If so, one needs to consider whether existing programs can expand to accommodate the numbers needed, whether other facilities and resources can be used to offer the needed program, or whether new programs and facilities are needed.

Contact with local and regional service agencies, professional groups, health planning bodies, knowledge of the newest trends in health care, delivery of services and current legislation affecting the system can all assist in identifying new growth areas in medical services, she felt.

The lack of available accurate data and statistics, she said, makes the determination of need a difficult task. Furthermore, the availability of resources--physical, human and especially financial-also complicates the need for growth.

Extending health services to a wider segment of the population and assisting in reducing the cost of health care are legitimate concerns and are directly related to determination of growth areas, Ms. Levitt pointed out. Most of the functions of given health service can be categorized into simple, intermediate and complex tasks. "Technicians can be prepared in one or two years to perform the simple and intermediate tasks most effectively," she stated, "These individuals work under the direction and supervision of the professionals who can then be freed to concentrate on the complex tasks." This arrangement, she explained, can help facilitate those concerns.

Based on this information, Ms. Levitt focused her discussion on growth in the newer occupation in the health services field. Among those she discussed were the following:

Medical Records Technicians--Because of the emphasis on Accountability and the increased use of the computer to store and retrieve data, medical record administrators have increasing need for technicians to gather, organize, retrieve, release and analyze health information.

Nuclear Medicine Technicians--Physicians have a growing need for skilled technicians as advances in the use of radioactive substances necessitate the use of more sophisticated equipment.

Respiratory Therapy--Skilled technicians, knowledgeable about respiratory conditions and the equipment used for treatement, are increasingly in demand with the rising incidence of respiratory diseases and the newer treatment modalities of these conditions.

Emergency Medical Technicians--The changing role and function of the hospital emergency room has created a need for shock and trauma units to treat the victims of

accidents and major catastrophies. Skilled attendants who can initiate life saving treatment immediately while transporting patients to these highly specialized units are needed in increasing numbers.

Human Services/Mental Health Associates--Because patients overburdened by social, financial, emotional or family problems often do not respond well to medical treatment, the need to offer assistance to people with these problems has increased as our society has become more complex.

Physician and Dental Extenders--The shortage of doctors and dentists make these assistants and associates invaluable as extenders of medical services. The changing emphasis for cure to preventative medicine and maintenance of health will require additional personnel to assist the physician and dentist.

Physical Therapy Technicians and Social Worker Assistants--Because professionals requiring a graduate degree to practice are in short supply, technical assistants would allow more people to benefit from the services offered and would assist in keeping the cost of health care down.

Veterinarian Technical Assistants--Veterinarians spend up to 65 percent of their time performing tasks that should be handled by technicians. There is a desperate need for people to assist in veterinary practice, laboratories and animal research.

"As long as knowledge continues to expand and technology advances, emerging growth areas in medical services will continue," Ms. Levitt said, "Changing patterns of delivery of health care will also contribute to the emergence of new occupations and professions in the health field."

What must be avoided, Ms. Levitt felt, is the prolification of highly specialized workers within clearly defined roles, function and job responsiblilities. "If an existing group of health workers have the skills and knowledge desired but are in short supply," she concluded, "it would seem more practical and economical to expand recruitment efforts to increase the number of those graduates to fill the void rather than create a new job category with overlapping job functions." This, she said, would reduce fragmentation of care as well as the number of people caring for each patient.

Biomedical Engineering Technology

Ouida Norris, associate professor and chairperson of the Biomedical Engineering Technology program at Monroe Community College in Rochester, New York, focused her discussion on the development of that program as the first community college based curriculum of its kind in the United States.

"The early 1960's," Ms. Norris stated, "began an era in which instrumentation and techniques, many originally developed for the space program, have been adapted to problems of diagnosis and treatment of human illness and to problems of medical research." In the interim, she added, it has become almost routine to expect to see, in a given hospital, many examples of products of this synergism between electronics and engineering and medicine. In citing just a few of those examples, Ms. Norris pointed to coronary care units in hospitals . . . the highly specialized and sophisticated instruments used to assess the pulmonary status in patients with acute or chronic respiratory problems . . . and clinical laboratory instruments used to test the blood for numerous conditions.

These were just a few examples, she said, that support the statement that there are now many instruments which are potentially useful to physicians and others that did not exist as recently as twenty years ago. "The key word here," she stated, "is 'potentially.' Whether or not an instrument is used to its fullest potential--whether the measurements made using it do the patient more good than harm--depends upon how well the 'care and feeding' of that instrument are implemented."

The individual capable of administering this care and feeding, she further explained, must have a basic knowledge of electronics and know enough about physiology, medical applications and the hospital subculture to communicate with doctors, nurses, technicians and others whose expertise, no matter how great, seldom includes electronics. "It is this individual," she said, "whom we graduate from our program in Biomedical Engineering Technology.

Monroe Community College began the biomedical engineering technology program, Norris explained, as a result of the State University of New York's decision to take its part in meeting the health technician demand delineated by a Joint Committee on Health Technology established by the National Health Council and the American Association of Junior Colleges about eleven years ago. First underway in 1967, it was begun with the expectation that, before many years passed, hiring graduates of the program as members of the health care team would become almost standard procedure. "In other words," she stated, "we thought that the idea of running a hospital without such individuals on the staff, or at least available on a shared-service basis, would have become as unthinkable as the idea of running a hospital without doctors, nurses, laboratory technologists or even administrators. This expectation, after having graduating our seventh class, has not yet been fully met."

The biomedical engineering technology program, Norris continued, is planned to give the student 1) a general foundation in electronics and related fields; 2) special courses in physiology; 3) special laboratories and lectures in repair and preventive maintenance of medical electronic equipment; and 4) field experiences in local hospitals where the student may observe the use, repair, calibration, etc., of specialized equipment for anesthesia- and cardiac-monitoring, cardio-pulmonary diagnosis, routine clinical laboratory determinations, etc.

Students are awarded an associate in applied science degree in Biomedical Engineering Technology upon successful completion of four semesters of work, she continued. The course of study consists of about 1500 contact hours (actual hours spent in lectures and laboratories), of which approximately one-half are spent in electronics and related subjects, one-fourth in liberal arts and one-fourth in special biomedical courses.

Graduates of the program, Ms. Norris concluded, now work in centralized instrument support services in hospitals or in research laboratories. Others work for medical electronics firms, traveling from one hospital to another repairing and maintaining instrumentation and providing a liaison between their company's research and development engineers and the physicians, nurses and others who

use the instruments. Another type of job held by the program's graduates is with service contract companies--again traveling from one hospital to another, but in this case implementing service contractual agreements on a wide variety of instrumentation.

The Family Physician

"We're witnessing a real dichotomy in health care today in the United States," explained Kenneth Gudgel, who for twenty years was a General Practitioner in a small rural eastern Washington town before accepting the position of Associate Professor in the University of Washington's Department of Family Practice and subsequently developing Spokane's Family Practice Residency program.

Dr. Gudgel, currently director of Family Medicine Spokane, continued: "We're in a horse and buggy delivery system on the individual physician basis, yet we're in the midst of space-age technology . . . we can transplant corneas, hearts, kidneys . . .solve by computers future genetic problems that we might run into . . .we can have cardiograms interpreted in Chicago instantly on a person here in Spokane . . . yet out in the rural and ghetto areas, indigent Americans go wanting for even the simplest of health care."

The problem, Gudgel felt, stems from the fact that we're unprepared for medicine's new technology. In spite of tremendous medical advances, health care is still dispensed on a one-to-one basis. "Patient health care," he said, " is the broad term under which needs for new technical skills can be subdivided and identified." "We need to identify a new doctor," he stated, "whose specialty or concern is for the whole person." This new doctor, he explained, is a family physician, not a physician who is specifically concerned about this or that illness, this organ or that organ, or a certain condition.

Gudgel explained the family physician as "a little bit like the ancient general practitioner . . . the old Doc Holiday type of guy." In spite of this image, receives three years of intensive training in the broad spectra of medicine.

The recognized "specialty" of a traditional medical specialist, Gudgel felt, is a vertical specialty, in which an individual comes to know more and more about less and less. He considers the family physician approach much broader, crossing all the fields of medicine in the training program . . . the surgery, physchiatry, pediatrics, orthopedics, etc., on a broad base. The family physician, he explained, is trained to take care of the entire person. This, he said, is not a new idea--rather, a rediscovery of an old idea. "We feel that we're sort of a new quarterback to the game plan of health care delivery," he stated, "and we think that it's in our hands that the ball should rest in some of the game decisions as far as health care is concerned."

The family physician concept, he said, requires adding many new technicians to the health "team." For example, he said, computers are becoming increasingly importtant in the field of medicine, helping to improve communications within the field, especially in the area of medical records, The work of the computer--in automated billing procedures, data retrieval mechanisms, automated histories and laboratory procedures--has greatly increased the number of computer-trained medical technicians required.

Another new development in medicine, he said, is a multiphasic screening study, called "data base." With data base, he explained, a patient who requires a complete physical exam spends time with a computer rather than a physician in outlining his medical history. In addition, he receives an automated electrocardiogram, chest x-rays, visual and hearing tests, pulmonary function and other tests that virtually indicate everything going on inside patient's body.
This system, he said, creates an increasing need for skilled technicians trained to read out and interpret the data. At the same time, the system saves a great deal of valuable time for the physician. "Instead of my allocating an hour to an hour-and-a-half to do a complete physical, I can do an exceptionally good job in thirty minutes because I have all this data in front of me," Gudgel explained. "To me, this system can greatly expand our present health care delivery."

"There is certainly still a tremendous need for the medical specialist," Dr. Gudgel emphasized, and I don't mean to imply that the new family physician is going to take over the field of medicine." He said, however, that the family physician can do a better job of recognizing total health care needs. As an example, he pointed to a patient who visits an internist, complaining of a stomach ache. "The internist," said Gidgel, "will send the patient to the x-ray department, the x-rays will show the ulcer, the diet is prescribed and the medicine given . . . and the patient is told to check in every two weeks until it's healed." He explained that the family physician, on the other hand, is trained to look beyond the immediate problem . . . to how the patient should be treated, not as an ulcer, but as an individual. "When the time comes," Gudgel said, "we'll send this man to the traditional specialist--perhaps several, depending on his internal, dietary, environmental and social-ogical needs. And this, in turn, will again increase the need for technicians in all of these areas." Gudgel said that physcians have pretty well recognized that the average person in his life span will have over 400 medical incidents. Three hundred of these a person would normally take care of himself . . . the cuts, headaches, the sprains and bruises . . . self-limiting illnesses and injuries. The remaining 100 incidents must pass through traditional medical channels. "I think if we can increase our knowledge and utilize our technicians properly and rediscover people to help physicians take care of these 100 medical incidents per person," Gudgel concluded, "we're going to be able to provide a lot better health care for these United States."

Identifying Human Resources Now--The Department Of Defense High School Testing Program

What is being and can be done to refine our nation's most important resource--youth? This question was the focus of Bernard (Rocky) Krockover's workshop presentation on the Department of Defense High School Testing Program. Krockover, a personnel psychologist for the Armed Forces Vocational Testing Group at Randolph Air Force Base in Universal City, Texas, issued a stimulating challenge to all of America's educators.

If we can all agree that the boys and girls in our high schools constitute a most vital part of our national resource of youth, he said, then it follows that our schools have the primary obligation of assaying the qualities possessed by these human assets and providing opportunities for their appropriate development.

Krockover referred to the 1973 Gallup Poll of Attitudes Toward Education, which showed that overwhelming approval is given today to proposals that suggest more emphasis in schools to the study of trades, professions and businesses to help students decide on their careers. In fact, nine out of 10 persons in all major groups sampled said they would like to have schools give more emphasis to this part of the education program, and most felt it should start at the junior and senior high school level. Many professional educators feel it should start even earlier--in the elementary grades.

Krockover went on to point out figures released by the Vocational Industrial Clubs of America (VICA), indicating that by the year 1980 there will be some 30,000 types of jobs available, 80 percent of which will require special skills needing vocational and technical training, but not a college degree.

"In spite of numerous findings such as these," Krockover stated, "the vast majority of schools throughout the nation still place the major emphasis on college preparation courses."

As did many of the speakers at this 12th National Clinic, Krockover pointed to the "academic syndrome" that seems to permeate and plague our nation's educational system.

In 1972, less than one of every four high school students was enrolled in vocational education," he said. "High school students are literally bombarded with the importance of obtaining a degree if they ever hope to amount to anything.

"Wherever a student turns for advice, he receives the same message--get your degree, that's the only way to success in the world of work. For whatever reason, the fact is undeniable that the mass of students are still plugged into the degree illusion."

The illusion exists, according to Krockover, simply because getting a degree is not the only way to success in the world of work. In fact, he said, more and more graduates of 4-year degree programs are finding themselves ill-prepared for the job market; many find themselves trained for jobs that don't exist or are so over-crowded as to prevent entry. As examples, Krockover pointed to the three supposedly "secure" professions. According to the American Council on Education, 24% of all American freshmen want to be doctors, lawyers or teachers. Statistics show, however, that many will find it difficult if not impossible to fulfill their ambitions in these areas. "If we can all agree that the primary purpose of education must be preparation for making a living," Krockover stated, "...then all of this data appears to reflect the exact opposite of what our majority programs should be. In short, we have done, and are continuing to do, a lousy job in engineering educational systems to fit the occupational realities of today."

Krockover stressed that this doesn't mean or imply that college orientation should be abandoned; it does mean that priorities must be structured to those found in the world of reality. "We must begin to realize that everyone is not destined to be the vice-president-in-charge, and only a few need to begin training for that position." A means must exist for channeling youngsters into positions that reflect their aptitudes and the stigma of non-college orientation must be removed, enabling students to move in the right direction at the right time. In short, Krockover continued, "When the wrong youngsters prepare for college, or

the wrong youngsters aspire to any particular skilled trade, we as a society are wasting our human assets, and we can no longer afford such a luxury."

Progress Borne Of Necessity

At the onset of World War II, Krockover explained, the Department of Defense found themselves with a need to establish a method for identifying the right person for the right job in the most expedient time frame possible. They found too many people trained and qualified for jobs which did not exist or were over-flowing, and not enough people for the jobs which were most in need of filling. To alleviate the problem, the Armed Forces developed classification tests. "By current standards, these were crude instruments designed to merely lump like jobs together, and then identify the incoming servicemen who appeared capable of performing in that job cluster," Krockover stated.

The services soon realized that as technology advanced, the need for qualified personnel would increase, creating a need for tests that would do more than merely categorize jobs and people. "Classification," he stated, "had progressed to aptitude." Since World War II, he continued, each service has worked independently to develop its own aptitude battery. With continual revising and refining, the batteries have been developed to reflect changing manpower needs.

The current testing system had its beginnings, according to Krockover, when the Department of Defense, in 1966, directed the individual services to examine their batteries and to formulate a combined, unified aptitude battery to satisfy the requirements for all occupational training offered in all branches. "The result," Krockover stated, "is known as the Armed Services Vocational Aptitude Battery--with special emphasis on the word 'Vocational.'"

The test, commonly referred to as ASVAB, was introduced in high schools throughout the country in 1968, with 350,000 students in 7,100 high schools tested. In 1974, using ASVAB Form II, the Department of Defense tested 1.1 million students in over 15,000 high schools.

Continuous technological advancements have caused continuous revisions in the test battery. "As products and vocations are refined and new applications are discovered," Krockover stated, "the skills and aptitudes required must be identified in addition to those we are already utilizing both in and out of the services." The level of education, experience and other variables concerning youth are also changing, he continued, causing a need for changes in the test to accommodate new criteria.

How the Test Works

Basically, Krockover said, the ASVAB is a two and one-half hour test battery, administered free of charge under the supervision of the Department of Defense, which focuses upon student aptitudes in a variety of vocational areas. Scores are reported to the counselor on each of nine subtests, and on five vocational clusters: General Mechanical, Motor Mechanical, Clerical, General Technical and Electronics.

Raw scores and percentile scores, he continued, are reported on each of the subtests and composites. These scores are further broken down to reflect each student's rank by grade, and by grade/sex. Literature is also available to reflect state and regional norms.

"ASVAB," Krockover stated, "is now the only comprehensive vocational aptitude test battery, standardized on over one million students, and offered free of charge on an absolutely no obligation basis throughout the country."

The services test sophomores and juniors, both male and female, in addition to seniors. Research has shown a high correlation between graduation from high school and success on the job; therefore the services have placed a priority on testing of seniors. However, they are also interested in determining the availability of resources for future training programs. Taking the test incurs no obligation; in fact, no type of recruiting is allowed during its administration.

Because it is not a recruitment tool, said Krockover, the test can be effectively utilized to benefit both the educational community and the military in solving common problems. In order to identify the abilities of each and every student, to provide the educational opportunities for optimum development of the discovered talents, and to guide each youngster into a program of training which is the most appropriate for him, educators and military personnel need facts about the range of individual differences and the proportion of students possessing important human abilities. Additionally, Krockover continued, each school needs to know what courses should be offered and who should take them.

An Opportunity To Work Together

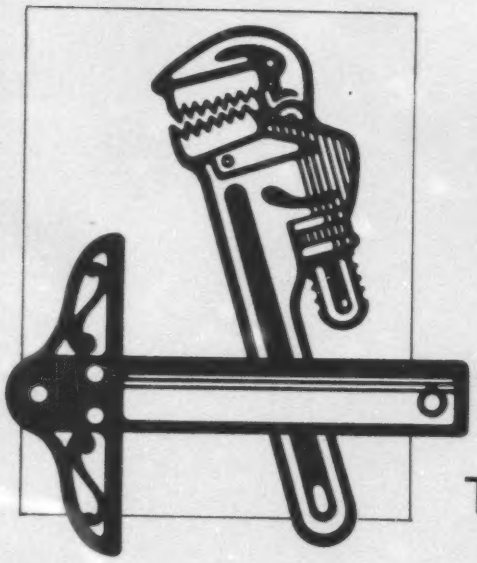
"The Federal Government and the Department of Defense," Krockover stated, "have both concluded that: (1) any program which enhances student awareness of job opportunities and alternatives in vocational pursuits is in the best interest of the individual and the nation, and (2) it is unquestionably the obligation of federal agencies to return to the taxpayer the lessons learned through government-funded research programs."

Naturally, he said, the services wish to stimulate interest in military jobs and training opportunities among young people, and to convey the message that military service is not a single occupation. "While we are fully aware that the majority of students who take the ASVAB will never enter the military service," he stated, "some students are afforded an additional alternative upon graduation." He emphasized the fact that vocational information provided by the battery is useful in counseling students regardless of their future plans. In addition, he felt that by offering the ASVAB, "student interest will be stimulated in the variety of skill training opportunities available through both the military services and comparable civilian institutions."

According to Krockover, the high schools of our country have the viable answer to educational and career planning for students. Schools can plan individualized curriculum; they can identify which and how many students possess various patterns of ability; and they can plan a positive program for personal counseling. It is the responsibility, he said, of both the educational community and the military services to assay the abilities which cover the entire range of individual differences

from the near genius to the less able, for all human resources.

"All this is possible through the use of ASVAB," he stated. "Used constructively, it is a tool which can make a significant contribution to the development of our human resources along socially useful lines, both in terms of society's needs and the individual's possibilities."



Technical Education In Washington

An overview of technological education in Washington, with emphasis on both chronological and philosophical development, led to an intriguing discussion of its current and potential status in the state during the "Technological Education in Washington" workshop.

Mr. Vern Hammer, Mr. Frank Wimer and Mr. Neil Uhlman, each with broad, diversified backgrounds in the field, gave unique insight into Washington's approach in providing technical education programs.

An Overview

Mr. Hammer, professor of civil engineering and head of the water and air resource center at the University of Washington in Seattle, presented the chronology of technical program development in the state, highlighting many of Washington's unique achievements in the 20th century.

Although the state has been somewhat traditional in its overall educational system, Hammer pointed out, Washington has always been at the forefront in junior college program development. As this system has developed, broadening into a statewide system of "comprehensive community colleges," all of the state's vocational-technical schools have been absorbed into and made an integral part of the system. Presently, 22 districts comprise the state's community college system, with a State Board providing overall guidance and direction.

In 1975, Washington remains in the forefront of community college education, Hammer said, ranking third in the nation in percentage of total state undergraduate enrollment. Almost 50 percent of all Washington undergraduate students are enrolled in community colleges.

At this time, he continued, approximately 60 percent of community college enrollees are in occupational training programs. The funding pattern is also occupational weighted, with a cost of approximately $750 per occupational student as opposed to $650 per academic student. More than 200 occupational programs are offered throughout the state's community colleges.

Hammer went on to emphasize the uniqueness of Washington's system as characterized by the lack of proprietary schools in the state. There are still no technical institutes, and relatively few proprietary schools. "Those few that do exist," he said, "are usually very small and very specialized."

During the early and mid-1960's, concurrent with the "boom" development of the community colleges, came a development within the four state colleges of baccalaureate programs toward degrees in Industrial Technology. This widening development, in turn, caused statewide recognition during the late '60's of the need to coordinate all technical education programs being offered at the state's various institutions. As a result, several of those involved in technological education began meeting on an informal basis, and in March of 1970, the Washington Council for Engineering and Related Technical Education (WCERTE) was formed.

"This is very unique," Hammer stated, "and has not happened anywhere else in the United States. It's really the first time when educators from very diverse technological programs at all different levels--that is, from the engineering and industrial technology baccalaureate degree programs, the two-year associate degree technician programs, the vocational-technical occupational programs, all recognizing the need to get together--have organized formally to exchange information and discuss mutual problems."

The organization, which is non-funded and has only voluntary institutional membership, now has representatives from almost all public and private institutions within the state, and has been found to wield considerable influence in legislative issues dealing with technical education.

In concluding his presentation, Hammer again stressed the success and importance of the WCERTE organization. "In summary," he said, "we can say that there have been some rather unique developments in the state of Washington, primarily in the attempt to really coordinate and work together in strengthening, in a broad way, occupational and technical education in the state."

Wimer Traces Philosophical Development

Frank Wimer, Deputy Director for the Coordinating Council for Occupational Education in Washington state, stressed the relationship of state developments with federal legislative evolution. He pointed out that vocational education in Washington has evolved differently than in many states, with most trade programs serving more adults on a "post-secondary" or "non-graded" basis.

Because the 1960's saw the absorbtion of vocational-technical programs into a comprehensive community college program, Wimer explained, Washington was able to expand quite rapidly when federal vocational-technical education funds became available. The 1963 Federal Vocational Act and 1968 amendments removed most restrictions in the range of programs to be offered with less than a baccalaureate program.

The intent of federal legislation, to "expand the breadth of vocational-technical education" was clearly carried out in Washington state, according to Wimer, because the shift to a comprehensive community college system allowed a more sophisticated development of technical education within the already developed vocational education system.

In its vocational-technical education system, Hammer said, Washington has remained firm in its adherence to basic tenets. Hammer went on to point out the following principles upon which program development is based:

1) Instruction is based on industrial standards;
2) Workers and supervisors involved in each occupation provide advice to schools;
3) Instructors must have experience in the area taught;
4) Equipment, materials, facilities and activities are similar to those used in industry;
5) Students experience, even in the first few months of training, the same work and working conditions that they'll find when out on the job;
6) Although curriculum intensity can vary, standards for all programs are the same, i.e., each program has internal integrity;
7) The state sets no distinction or difference in the funding of vocational or technical education, i.e., all funding is based on the same formula.

"In this state," explained Wimer, "it has been philosophically an expansion of vocational education concepts rather than a separate system for 'technical education,' and technical education in this state is identified as a separate group only in coding of the occupations in reports."

In re-emphasizing Washington's achievements, Wimer stated, "We have in this state been able to maintain technical education as an expansion in filling the gap in the total educational spectrum."

Uhlman: Technological Education Clearinghouse

Meeting the state's current and future needs in technical education areas is a prime concern for Neil D. Uhlman, Director of the Technological Education Clearinghouse for the Council on Higher Education in the state of Washington.

Focusing his remarks on the area of engineering technology, Uhlman observed that educators, people from industry, legislators, students and others have become increasingly aware of the need for expanding educational opportunities for technicians.

Recent assessment indicates a very possible need for a baccalaureate degree program in engineering technology within the state, according to Uhlman. The fact that students desiring the baccalaureate degree in engineering technology have to leave the state to satisfy that goal, he explained, constitutes a problem area, since those students appear to be steadily growing in number.

What is the state doing to satisfy this and other needs? In 1969, a group of community college instructors made a survey of the "Technical Needs of Washington Industries." Industry indicated a possible need for engineering technologists, and as a result, the survey attracted the attention of many of the state's politicans.

The 1969 Legislature directed a study to determine the feasibility of establishing a polytechnic institute in the state with the primary intent of awarding Bachelor of Technology degrees in certain specified fields. A consultant was retained to develop a comprehensive report. "In general," Uhlman stated, "the report said that the creation of a polytechnic institute would be an appropriate solution to meeting the state's long term need for technically trained manpower. However, the report indicated the immediate need of such an institute was unclear."

The report further suggested that a technological education study center be created to provide statewide coordination of technical education and to continue the needs' assessment of the polytechnic institute.

"This all happened about the time that the state's economy began to falter," explained Uhlman, "so the state was not about to invest in another 'mortar and bricks-type institution' at that time."

The 1973 Legislative session directed the staff of the Joint Committee on Higher Education to prepare a study on the best possible way to utilize existing facilities to meet the short term, immediate needs of the state. Other concerned groups were already studying the problem, including the American Society of Engineering Education (ASEE) nationally, and WCERTE locally.

After reviewing the various studies that had been made, the joint committee made the following recommendations to the 1973 session of the legislature:

1) There should immediately be established a clearinghouse in technology, with responsibilities for compilation and distribution of information to provide career guidance information of all programs and levels of technology; assistance in curriculum development; coordination of long-range technological planning; and assistance in maximizing federal and other non-state funding grants for program development in technology.

2) Programs beyond those offered by community colleges and technical institutes should not necessarily be geared to the traditional baccalaureate framework requiring residency, general education courses, etc.,

and should not necessarily result in the awarding of a baccalaureate degree.

3) The efforts of the state colleges to expand and improve their current industrial technological programs are commendable and should be given continued priority.

"As a result of these recommendations," Uhlman said, "the Legislature, early in 1974, directed the Council on Higher Education to set up and operate the Technological Education Clearinghouse." Uhlman assumed the duties as Director of the Clearinghouse on November 1, 1974.

Several goals were established for the Clearinghouse, and from those goals have developed three major projects that the staff is currently working on. As a priority, the Clearinghouse is conducting a needs' assessment for the baccalaureate degree in engineering technology. Assuming that need exists, the staff is developing a model whereby a baccalaureate degree in engineering technology can be offered in the state. Currently in a very preliminary stage, the model is being developed in cooperation with an ad hoc committee composed of people representing the various institutions in the state.

In addition, the Clearinghouse is proposing a "mobile technical education guidance center." The staff will compile information on technological education opportunities presently available in all post-secondary institutions in the state. The mobile unit will allow dissemination of the information in a non-recruiting fashion. According to Uhlman, the unit would visit fairs, industrial plants, shopping centers and other areas of population concentration. "The career guidance effort presently being done in the agencies and institutions," he said, "will not be duplicated, only supplemented."

Marketing Technical Education

The public image of technical education, the public's right to know in terms of dissemination of information and priorities in improving communication were issues for discussion in the "Marketing Technical Education" workshop, chaired by Jane A. Johnson, Public Information Coordinator of Washington Community College District 17.

Rowland Bond, retired educational reporter for the Spokane Daily Chronicle, Bob Briley, Public Affairs Director for KHQ-TV in Spokane and Walter Schaar, General Manager for KSPS Educational Television in Spokane each offered ideas for bettering communication of the technical education story. Although each pointed out that few problems usually exist on local levels, each acknowledged problems--especially with the image of technical education--on the national level.

Briley Indicates Priority Needs

Speaking of individual colleges and vocational-technical schools, Bob Briley pointed out priorities to be set in meeting the challenge of marketing technical education. Most important, he said, is for the college to have on staff a professional public relations-oriented person with knowledge of local programming needs and potential to provide media with resources for programming. Briley pointed out the importance of having a public relations person who has the ability and desire to establish personal contact with people in the media, who has knowledge of each medium and the people within each organization who can be of help to the college. Briley also acknowledged the importance of building up an awareness within the community that technical skills are necessary, and that technical institutions can make an important contribution in meeting the communities employment needs.

Schaar Sees Marketing Need

Walter Schaar, in pointing out additional priorities for technical colleges, emphasized the basic difference educators find in working with commercial versus educational media. In educational media, Schaar stressed, political problems must often be overcome before effective education-media relationships can be built. Once this problem is overcome, said Schaar, educators and media people must work together to "market the product" of technical colleges to the public, the product being, namely, students who are equipped to take jobs within the community.

The stigma of technical education and, in turn, of the people who are technically as opposed to academically trained, is a basic image problem that must be overcome before technical education can really be effectively marketed, all three speakers agreed. Although the speakers had varying beliefs as to what "stigma" actually exists in today's society, all agreed that educators and media people must work hand in hand in attempting to change the image that often attaches that stigma to those who receive technical training and later take career positions utilizing their specialized skills.

By taking a positive, advertising-oriented approach, attitudes can be changed, all the speakers agreed. By stressing positive achievements of technically-educated adults, by stressing the need in society for technically skilled people, and by pointing out the important relationship that must exist between employers, colleges and the public at large, some of the stigma that does exist can possibly be erased.

Bond Condemns 'Apologetic Smile'

One of the problems, as Roland Bond pointed out, is the attitude of those involved in technical education themselves. "Having dealt with technical education since World War II," he said, "I've felt that the vocational education people as an entity have been wearing kind of an apologetic smile." Perhaps the reason for this, he pointed out is that it has been accepted practice in this country for all parents to want all children to grow up to be "the best," and to them, that usually connotates becoming a doctor, lawyer or dentist. Therefore, technical education has been helping people get where parents don't really want them to go. Perhaps, he continued, this stems from too much separation between vocational education and academic education. "The Carnegie Foundation," Bond point out, "recommends that community colleges should provide a diverse program of academic, occupational and

adult education rather than strictly specialized training." By becoming more demanding, he felt, technical schools can turn out a better product culturally, shortening the gap between graduates of community and technical colleges and four-year colleges.

Schaar went on to point out that although the nation as a whole is higher-education oriented, our four-year institutions are often producing academically educated persons who have little success in finding employment. An important aspect of marketing technical education, he said, is in showing that technically educated persons are well-equipped for the job market. An important part of this concept, he pointed out, is demonstrating the relationship between the technical college and the community's job market situation. Discussion from the audience prompted the observation that often "marketing technical education" requires a two-prong thrust: one, in the recruitment of students, and the other in the recruitment of employers. The media's role, observed Schaar, was not to "sell" the institution, but to get the various targets of the thrust "matched up." Parents, students and employers must all receive the message of technical education's value and place in society.

In a discussion of internal communication problems faced by colleges, the need for individual as well as collective effort was quickly pointed out. No public relations effort in the community can be successful, the audience agreed, without positive reinforcement from all members of the institutional "team" that includes administrators, faculty, staff, and current and past students.

In summary, the focus of the workshop was of two directions: One, the need to establish a good working relationship between educators and media in marketing technical education; and two, the need to stress, through cooperative efforts, the importance of technical education and the positivism and success of technical education programs, to parents, employers and students, who in turn can communicate that attitude of success in an evolutionary pattern of continuance.

Arthur A. Binnie

Technical Education -- The State Of The Art

I recognize and appreciate the efforts of Community College District 17 and its President, Dr. Walter Johnson, in putting together this very successful conference. He and his staff deserve thanks from vocational educators from all across the State, and I speak for them in saying, congratulations for a job well done. Vicariously, each of our state's practitioners shares in welcoming this illustrious gathering.

The topic chosen by your arrangements committee was "Technical Education - the State of the Art". Thinking about that at first, the notion came to me that perhaps this "art" was really obsolete. No, not the technical education art...this Art - Art Binnie. You know, I haven't taught a class in technical education since 1968. And while my administrative experiences since then certainly keeps me in tough with the progress you have been making as practitioners, you and I both know that it isn't the same view one gets by being where the action is... right in the classroom. So, perhaps Art the instructor is obsolete. In preparing my remarks, then, I determined to focus on some of the broader issues. That thought prompted still another notion about how times have changed. Back in 1968 when I was teaching, if the issue under discussion came under the heading of "broad", it wouldn't have had anything to do with technical education.

What should this clinic do for you, its participants?

It seems to me it should acquaint you with some of the national perspectives. When you leave Spokane, you should carry away a better understanding of both the strengths and weaknesses of technical education. And, if those who've participated here with you have done their jobs well, you should have identified some of the particular ways these issues of national scope relate to your particular problems in your home communities. You should leave this clinic with some solutions to those problems.

It seemed appropriate to me to employ the term "clinic" in a medical sense and to use some medical terminology and medical methodology of these remarks. First, we are going to examine the patient and make a diagnosis of its health. Second, we will write some prescriptions, if, indeed, poor health is discovered and medication will be of value.

Now, how does one go about examining a patient as large and complex as the field of technical education? It seemed that many or most of its component parts were represented right here at this clinic. So I've used this setting in the past few days to conduct my examination. You and I have heard from some very knowledgeable persons. They have provided glimpses of emerging technologic change. Topics have ranged into environmental protection, fossil fuels and nuclear energy, health sciences, economic developments, and quite a range of impressive and even exotic disciplines. The data emerging as forecasts of the future for technical education certainly looks promising.

The clinic conferees have looked at emerging educational patterns. There have been talks about faculty development; the efforts being directed toward developing a bilingual delivery system; discussions about the emerging trends brought about by the transition from MDTA and CETA, with our partners in the departments of labor in the business of training people for jobs; and, our thinking has been stimulated by discussions of the metric conversion problems. Curriculum dissemination, relating to emerging technologies, has also been in the topical coverage we have viewed of the national curriculum network and its regional laboratories that are dedicated to reducing duplication and improving access to newly developed materials.

Another opportunity to examine the patient came about from perusing many of the vendor displays. I was seeing the new products of our private enterprise colleagues who are also engaged in the business of improving education and the teaching arts. I examined an electronic scanner, discussed IBM data processing equipment, explored machinist and auto mechanics materials that had been developed for CETA clientele, and skimmed through some texts that are being sold today. From these many new developments, I saw much of the technical education state-of-the-art.

And if each of you doesn't plan time to view convention displays, I urge that you make some time to do so. It's time well spent.

A good diagnosis should include x-ray examinations. For my x-ray machine, I chose the insights provided through the ERIC system (Educational Resource Information Center). I ran an ERIC search into the health of technical education that produced a list of each filed resource and an abstract of its contents. The ERIC system can produce information that identifies problems, arrives at conclusions, and offers recommendations. An ERIC search reveals who the producers of new developments are. Not only are public educators listed, but I discovered many contributors from labor, the military, and non-public education. The list of contributors is large and the subjects covered are wide ranging.

As a result of this careful examination, it is my diagnosis that the patient is in robust good health. However, it needs help from some of my colleagues. I believe that, at the least, my patient is neurotic, or, at the worst, so out of touch with reality as to by psychotic. The patient needs a psychiatrist. Technical education doesn't know it is. It is suffering from an identity crisis. It may be schizophrenic. As I perceive it, the patient is in need of further help; the kind that you and I, as professionals, should be able to provide.

Ten years ago, I attended a similar clinic on technical education at Charlotte, North Carolina. There was little doubt then about what we were there to explore and discuss. But several times since my arrival here, I've gone back out the door to take another look at the signs over the entrance. Perhaps they would have been more accurate had they been lettered "Western AVA Conference". The span of the problems discussed and solutions being sought has extended to all phases of vocational education and technical education for the purposes of this clinic.

My recollection of the Charlotte clinic is that we had a basic concern with engineering technologies and escalating involvement in electronic data processing. Technical education had a definition. In substance, that defined an occupational area, not requiring a baccalaureate degree, that was based upon a foundation requiring manipulative skills and heavy applications of mathematics, life, and physical sciences.

Today, that definition has been greatly broadened. My concern is that it's become to broad. And that concern is certainly in full recognition that technology, per se, has in itself become broader. I recognize the rightful inclusion of health sciences, environmental sciences, and some others. Perhaps that is as it should be. But when does a craftsman become a technician? If technical education, or technical educators, cannot define that point, and technical education as a discipline becomes fuzzy and unable to communicate its goals and objectives to labor, to governments, to the publics, or to itself, I suggest that technical education is suffering from an identity crisis.

If you don't know who you are, you have no way to determine where you are going.

On the positive side, I found little indication of what is called "B.A. fever" or "academic cultivation". The pressures to escalate technical education programs into baccalaureate programs are still around us. But I believe those pressures are not substantially increasing at this time. There is no doubt that their continued existence is due, at least in part, to the same problem I'm referring to; the lack of a clear definition for technical education.

In our efforts to identify cause and effect as we explore the health of technical education, let me caution you not to lose sight of some external activities with the potential for substantial outcomes on program development. I refer to what is lumped together as a "consumer protection" movement. I serve as a consultant to the USOE Committee on Institutional Eligibility and Accreditation. Make no mistake, there is a real examination taking place of both public and proprietary schools with regard to what students have the right to expect from institutions as "full disclosure of fact" and what obligations those institutions have in making prospective students aware of circumstances prior to enrollment. Reliable data must be available regarding job opportunities, success of graduates, drop-out ratios, class sizes and facilities descriptions, and other pertinent facts that affect the students' decisions to enroll. We must provide them with the reasonable assurances that the goals they seek are achievable. These increased responsibilities for consumerism issues require additional clarity amongst the practitioners about the roles and goals of their respective disciplines.

As a final diagnostic evaluation, I believe the patient evidences absent-mindedness at times. The ERIC search to which I previously referred, revealed a rich set of resources with which to solve our problems. But I find a disappointing level of awareness of those or application of them. In almost every conference room, the audiences contained persons who had solutions to offer to some of the problems surfaced by the respective panels. Inside the collective heads of you people here, is a data bank already containing enough information to greatly improve technical education in the United States and to better serve the needs of the disadvantaged, handicapped, and others who want to be trained as technicians. These knowledge resources are not being fully utilized. We must make better use of what we already know. We must stop being absent-minded and, as a result, wasting resources reinventing the wheel over and over again.

Having made my diagnosis, let me try to prescribe some remedies.

I have already revealed my first priority. We need to define technical education; to establish its knowledge base, its purposes, and its limitations. Such a definition should recognize technical education as a part of vocational education, but with a body and knowledge of its own. If we can't identify that body and knowledge, then holding future clinics on technical education would be futile. We can and should participate in the AVA conventions and let it go at that.

A prescription needs to establish a mission and role for technical education. We need a national plan. One that would not

neglect the imperative of interfacing or articulating technical education into the career education experiences in lower grades. The mission and role must include technical education offerings at the postsecondary level that prepare persons for work and not simply provide vestibule training for baccalaureate programs.

Our task needs to include reaching agreement on a definition for "technological education". For my purposes, that implies degree-level accomplishment, or high-level skill preparation that will, by plan, be augmented with further college or university education.

My prescription includes instruction to the patient regarding dosage. We need to ingest many of the pills already on the market. I'm speaking of the kinds of information in research and technical journals such as my ERIC search revealed. For example, let me highlight just two bits of ERIC data. One study examined upper-grade high school programs and reported that a chief concern among technical educators teaching in the junior and senior year classes was how to move from collective, or group instruction, to highly individualized instruction. That was a need perceived in secondary schools. But also in the ERIC files is the study of a man named Sullivan that contains some specific solutions to their problems. The Sullivan study found that individualized instruction is cost effective when it was designed to clearly meet well defined, existing instructional needs; it is cost effective when it specifies student performance requirements, and when it is administered under a unified system with controlled quality. Individualized instruction, Sullivan concluded, is cost effective when it is developed and produced by the teachers who are going to use it.

I don't know with certainty, but since the entry delineating need postdates the entry advancing a potential solution, I can assume that the group which developed the needs study never inquired into what was already available. We are not using what we already know. And I submit that it will go a long way toward improving our collective abilities to deliver technical education if we begin to look before we leap.

Finally, my prescription advises that you accept the fact that we have a system of delivering vocational education services in the United States that consists of a number of components. We do not have a single delivery system. For so long as educators perpetuate that myth and peer myoptically about their own baliwick looking for unilateral solutions to problems, conditions are unlikely to improve. Labor is in education, especially vocational education, through programs such as CETA. Only 6% of funds spent under this Comprehensive Employment and Training Act are going into public educational institutions. Private industry is in education. Many in-house training programs are in the field of technical education. Community resources of many types are employed to provide educational opportunities and, in my judgment, many more will need to become involved in the months ahead. The financial crunch now facing education no longer can permit wasteful or unnecessary duplication of facilities or programs.

Some of the programmatic areas in CETA are not really technical education. That is, they are short-term, entry-level skill training programs. I call that craft or non-technical education. But that focuses again on the need for careful definition. If you don't know who you are, or what you are, it's impossible to form constructive alliances with your private sector counterparts. Technical education and the vocational education components in the labor community must join together as a team. The traditional rivalry is a luxury America can no longer afford. But to avoid being lost in such alliances, clearly defined parameters for technical education must exist going in.

That's your challenge for today.

If all this leaves you feeling somewhat uncomfortable about the state of the art of technical education, then this clinic has been successful. Few real improvements come about from persons being satisfied with the status quo. You may not agree with my prescriptions, but I hope they will not detract from the very real nature of the illness and the need to search for cures.